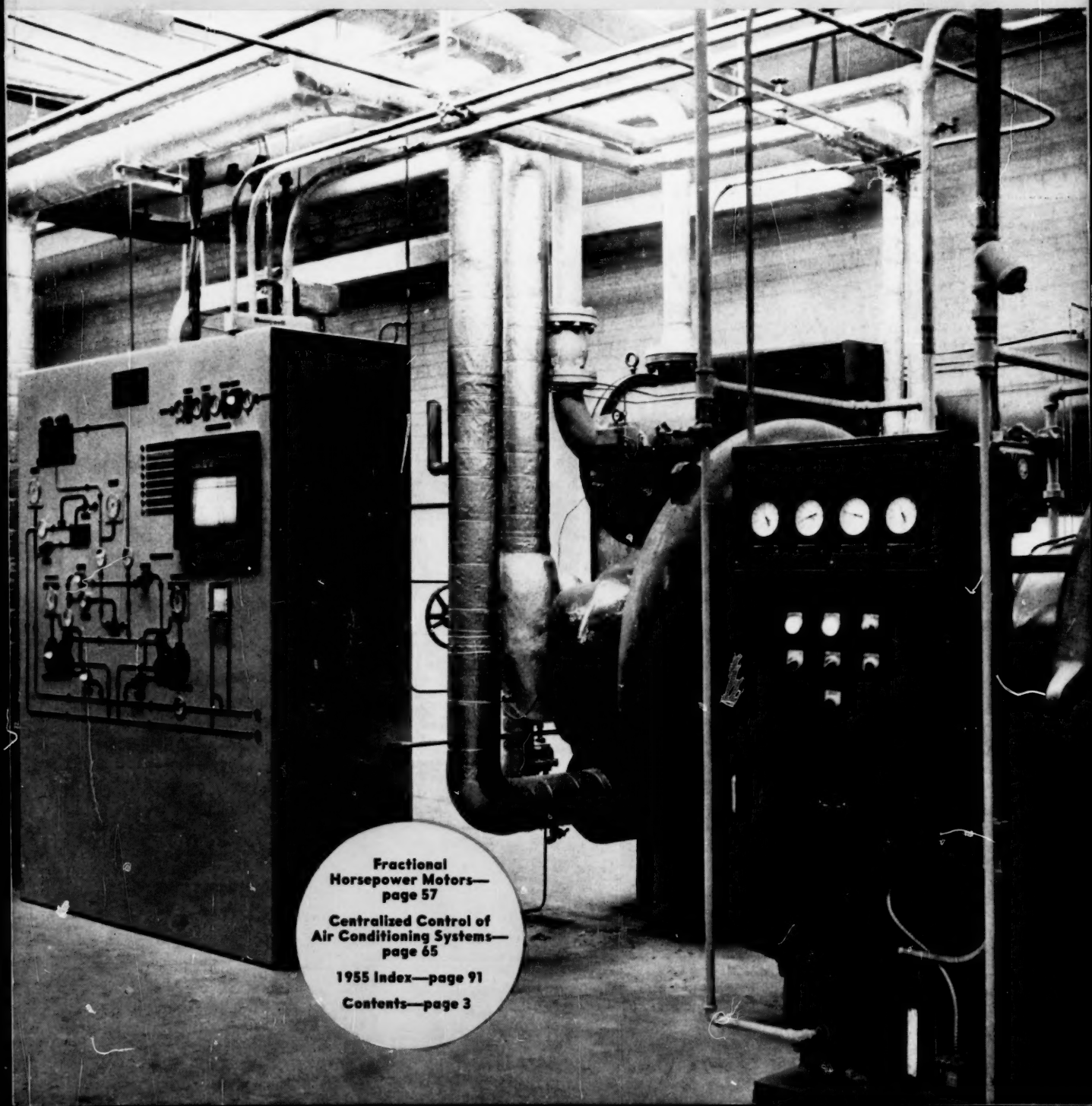
AIR CONDITIONING HEATING AND VENTILATING

JANUARY, 1956 – 53rd YEAR



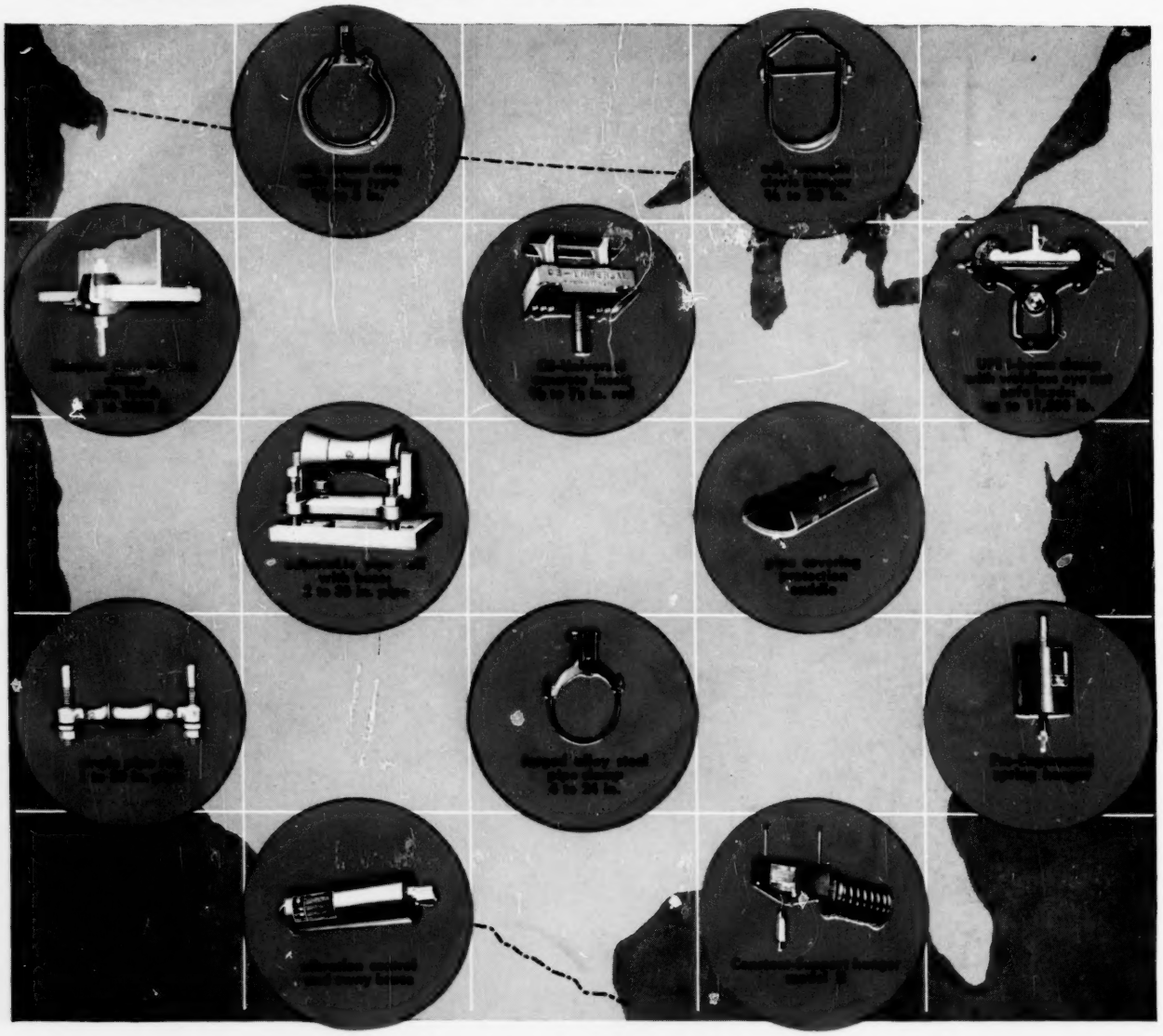
Fractional Horsepower Motors—page 57

Centralized Control of Air Conditioning Systems—page 65

1955 Index—page 91

Contents—page 3

GRINNELL OFFERS YOU



the largest line, widest distribution, finest service in

PIPE HANGERS AND SUPPORTS, ANYWHERE!

Grinnell is America's No. 1 supplier of pipe hangers and supports. There is no other company, anywhere, which provides as thorough and complete distribution service; makes as complete a line; or can cooperate as fully with you on *all* your piping assignments..

Through Grinnell's coast-to-coast system of strategically located warehouses and jobbers, for example, you can purchase Grinnell Hangers out of stock, anywhere. Moreover, Grinnell, alone, of all manufacturers, maintains a staff of trained personnel that is ready to work with you "on the job", anywhere, in solving any problem connected with erection of pipe hangers and supports.

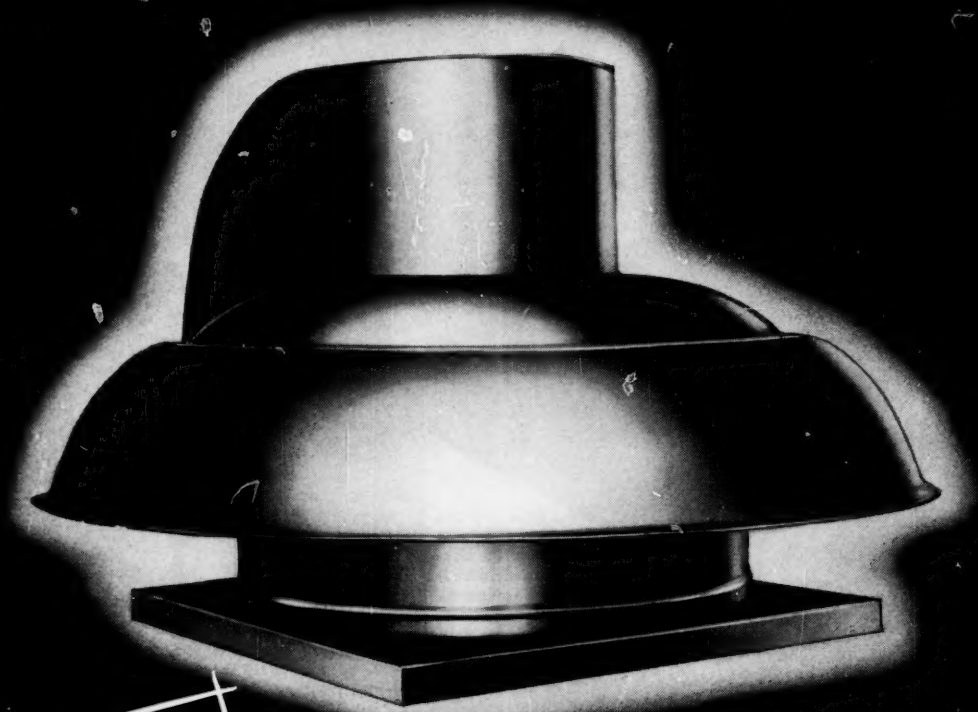
Profit by Grinnell's nationwide service, large-capacity manufacturing facilities, and practical knowledge gained during more than 100 years of service in the piping field. Next time, specify Grinnell Pipe Hangers.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems



new!

CENTRIFUGAL ROOF VENTILATOR . . . WHISPER QUIET, LOW SILHOUETTE

For whisper-quiet operation. Running at low tip speeds, moves large volumes of air efficiently against static pressure. Low in silhouette, distinctively profiled, blends well with modern architecture. Send for new 16-page catalog which also contains a section, "How to Select a Roof Ventilator."

De Bothezat FANS

A DIVISION OF

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS, Dept. HV-156
Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

☐ Yes, please send me catalog on your new Centrifugal Roof Ventilator.

FIRM NAME

ADDRESS

CITY ZONE STATE

ATTENTION MR.

Air view of Nabisco's new Chicago bakery indicates its unusual architectural conception as well as its huge size.

B&W Integral-Furnace Boilers, Type FM, in service at Nabisco. Delivered completely shop-assembled, FMs are ready to skid or lift into position, connect to services, and place in operation.

keeping steam cheap . . .

World's Largest Bakery

served by 3 B&W *Integral-Furnace Boilers, Type FM*

Typical of the increasing demand for the B&W Type FM Boiler was the choice of a multiple-unit installation for the largest, most modern bakery in the world, capable of producing 167 million pounds of baked goods annually. Occupying 12 acres of a 45-acre site, National Biscuit Company's new Chicago bakery is an outstanding example of scientific application of straight-line mass production methods combined with the highest standards of cleanliness and sanitation, and striking architectural beauty.

Since January 1952, the three FM units have been generating steam for heat, hot water, and various processing operations, such as melting shortening for easier unloading from tank cars and to facilitate its distribution within the plant.

Designed to produce 25,000 lb of steam per hr each at 110 psi pressure, the B&W Units are oil-fired—make a positive contribution to the elimination of smoke and fly ash required by Nabisco. Choice of the three FM boilers rather than a single, larger unit resulted after careful consideration of all factors and a realization that the FM unit offers the benefits of "package" steam combined with many cost-saving big-boiler advantages.

COST-SAVING FEATURES of the B&W Type FM Boiler

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Satisfaction with the performance of the B&W Type FM Boiler is proved by the number of units in service and on order for industries, utilities, and other users in practically every category. In terms of total steam capacity they add up to well over 10,000,000 lb per hr, and better than half of this capacity is in multiple-unit installations. The compact, shop-assembled FM is available in standard sizes for loads ranging from 2900 to 40,000 lb per hr at steam pressures to 235 psi—is also available for higher pressures, and with moderate superheat.

Bulletin G-76A describes in detail the many cost-saving features of this self-contained, popular small boiler. Write for your copy. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.

G-642 A

BABCOCK & WILCOX BOILER DIVISION

AIR CONDITIONING HEATING AND VENTILATING

JANUARY, 1956

Editorial Staff
Editor
CLIFFORD STROCK
Associate Editors
NATHAN N. WOLPERT
WILLIAM B. FOXHALL
Assistant Editor
WALLACE G. HOLBROOK

Published by
THE INDUSTRIAL PRESS

Executive, Editorial and Subscription Offices,
93 Worth St.,
New York 13, N. Y.

CONTENTS

VOL. 53 No. 1

FEATURE ARTICLES

Fractional Horsepower Motors—T. E. M. Carville and L. W. Buchanan 57
Newspaper Plant Air Conditioning System—M. L. Hoglund 65
Steam Service and Air Conditioning for a Mental Hospital 68
Applied Solar Energy 78
Air Conditioning Improves Ring Manufacture 89

REFERENCE MATERIAL

Section—High Temperature Water—Part 5—O. S. Lieberg 69
Detail Sheet—Winter Supply Air Unit 109
Data Sheet—Steam Losses from Steel Piping; Dimensional and Capacity Data—Copper Drainage Tube ..... Opposite 150

DEPARTMENTS

High Spots 5
Washington Overtones—L. Overman 6
Briefly Stated 10
Piping and Plumbing—L. Blendermann 84
London Letter 86
What Would You Do? 88
Temperature Forecast 90
Index to Feature Articles—1955 91
Book Reviews 93
News of Equipment and Materials 94
Product Applications 107
Degree-Days for November, 1955 114
News of the Month 118
Coming Events 128
Ad-Digest 131
In The Field 136
New Catalogs 138
Index to Advertisers 148

The Cover: Huge and variable air conditioning load at the new plant of The Houston Post is handled by Trane compressors controlled at a central station equipped by Minneapolis Honeywell with a graphical control panel showing all flow directions and conditions. See page 65.

AIR CONDITIONING, HEATING AND VENTILATING, published monthly by The Industrial Press, 116 Main St., Norwalk, Conn. Executive, editorial and subscription offices, 93 Worth St., New York 13, N. Y. Entered as second-class matter, February 16, 1954, at the Post Office, Norwalk, Conn., under Act of March 3, 1879. Printed by O'Brien Suburban Press, Norwalk.

Subscription Rates: In the United States and Canada, one year, $3; two years, $5; three years, $6; in all other countries, one year, $7; two years, $11. Single copies, 30 cents.

Copyright: Copyright, 1956, by The Industrial Press, New York, N. Y. Permission required to reproduce articles.

Member of National Business Publications, Business Publications Audit, Society of Business Magazine Editors.

Executive Officers, The Industrial Press: President, Robert B. Luchars; Vice-President and Treasurer, Edgar A. Becker; Secretary and Publishing Manager, Harold L. Gray.

Advertising Representatives: George G. Turner, 228 N. La Salle St., Chicago 1, Ill.; Harry J. Twine, 93 Worth St., New York 13, N. Y.; Thomas A. Earing, 93 Worth St., New York 13, N. Y.; Edward B. McEntee, 17115 Hillsboro Rd., Cleveland 12, Ohio; Robert H. Deibler, 2506 W. 8th St., Los Angeles 57, Calif.; Richard E. Hoierman, 2831 El Capitan St., Dallas 28, Tex.

Indexing and Microfilm: Contents of AIR CONDITIONING, HEATING AND VENTILATING are indexed monthly by Industrial Arts Index and microfilmed by University Microfilms, Ann Arbor, Mich.

G-B DISTRIBUTORS

Atlanta . . . SYcamore 4-9511
Billings, Mont. . . 9-2419
Birmingham, Ala. . . 4-5461
Brookline, Mass. LOngwood 6-8381
Buffalo, N. Y. . . PArkside 3710
Charleston, W. Va. . . 3-9467
Charleston Hts., S. C. . . 4-5973
Chicago . . WAterfall 8-8135 or FUlton 5-0550
Cincinnati . . . CHerry 1-7435
Cleveland . . . SKyline 1-4200
Columbia, S. C. . . 2-3361
Columbus, Ohio . FAirfax 6033
Dallas, Tex. . . PRospect 7300
Davenport, Iowa . . . 2-6205
Denver, Colo. . . CHerry 4-6569
Detroit . . . TAshmoo 5-6000
El Paso, Tex. . . 3-9611
Fargo, N. D. . . 4411
Ft. Smith, Ark. . SUnset 3-1155
Ft. Wayne, Ind. . ANthony 8482
Ft. Worth, Tex. . FOrtune 4827
Greensboro, N. C. . . 2-5250
Gulfport, Miss. . . 3866
Houston . . . JAckson 9-4649
Indianapolis . . MElrose 5-3451
Jackson, Miss. . . 3-3597
Jacksonville, Fla. . . 6-7636
Joplin, Mo. . . MAyfair 4-4366
Kansas City, Mo. . GRand 1-0700
Little Rock . . FRanklin 2-7221
Los Angeles . ANgelus 3-6961 RAymond 3-6521
Louisville . . . JUniper 4-7845
Memphis . . . JAckson 6-7321
Miami, Fla. . . 65-2595
Milwaukee . . GLenview 3-6786
Nashville, Tenn. . . 4-6661
New Haven . . . MAin 4-7682
New Orleans, La. . . CAnal 7781
New York . . . WOrth 4-8550
Oklahoma City . REgent 9-2825
Omaha, Nebr. . . ATlantic 1155
Philadelphia . GArfield 6-8240
Pittsburgh . CHurchill 1-7100
Phoenix, Ariz. . . ALpine 4-9764
Raleigh, N. C. . . 2-3501
Richmond, Va. . . 82-6748
Rockford, Ill. . . 2-3711
Salt Lake City . . ELgin 9-1966
San Antonio . . TAylor 2-1509
San Francisco . SUtter 1-5967
Savannah, Ga. . . 62461
Seattle, Wash. . . SEneca 7250
St. Louis . . CHestnut 1-0445
St. Paul . . . MIdway 6-7865
Syracuse, N. Y. . . 73-0216
Tampa, Fla. . . 4-4911
Tulsa, Okla. . . CHerry 2-3145
Tupelo, Miss. . . 2245
Washington, D. C. . . AD 4-1928
Wichita . . . AMherst 7-1208

See our catalogs in Sweet's Architectural & Plant Engineering Files

GUSTIN gb BACON

Line ducts with ULTRALITE #300

and move up to 7500 cfs of air—

- ***without* objectionable noise!**
- ***without* eroding the duct liner!**
- ***without* much more air resistance than you get from *bare metal* ducts!**

For performance, there is nothing on the market today like Ultralite #300 — the only spray-coated duct liner of long textile type glass fibers.

Ultralite #300 possesses the density that it takes to silence high frequency fan noise. Its long staple strength and spray-coating prevents delamination even in high velocity systems. And its .021 friction coefficient compares very favorably with .019 coefficient of unlined bare metal ducts.

Ultralite #300's performance in all air conditioning systems — low, medium or high velocity — can well mean the difference between a successful and an unsatisfactory job . . . may even mean a difference in the size of duct required to handle the flow of air! Get the facts today from your nearby Ultralite distributor whose phone number is listed in the adjacent column.

Write Today for New 8-Page Technical Brochure "Ultralite Thermal and Acoustical Duct Insulations"

GUSTIN-BACON *Manufacturing Company*

222 W. 10th ST., KANSAS CITY, MO.

Thermal and acoustical insulations • Molded glass fiber pipe insulation
Pipe coupligs and fittings

HIGH SPOTS

• The **air conditioning industry** in 1956 will **break all previous records** for the seventh consecutive year with total sales at retail of about $3.2 billion, Cloud Wampler predicted at a year-end preview of Carrier's new line of forced warm air heating units and room air conditioners.

• A revised proposal of the Consumers Public Power District of Nebraska to build a **nuclear power plant** under the Demonstration Reactor Program **has been approved** by AEC. Plant will be a sodium cooled, graphite moderated, 75,000 kw generator. Detroit Edison and the Nuclear Power Group including Commonwealth Edison have also submitted approved plans for demonstration reactors.

• Air velocities of **3800 miles per hour** will be developed in the **world's largest wind tunnel** built for the Air Research and Development Command at the Arnold center in Tullahoma, Tenn. The world's two most powerful motors, built by Westinghouse, will develop 83,000 hp each to drive giant air compressors. Two 25,000 hp starting motors are required to help bring the bigger motors up to speed.

• For the first time in many years, **annual sales of anthracite** by producers showed an **increase** for the full year ending October 31. One factor was a 35% increase in sales to the coke manufacturing industry.

• Kaiser Aluminum has launched a $280 million expansion program to **increase capacity** to 654,000 tons a year. Plans include two new **aluminum plants** and a new chemical plant.

• **To check water evaporation from reservoirs,** Texas officials have formed a cooperative project to seek sponsorship for a research project at Southwestern Research Institute on a thin (0.0000001 inch) **chemical coating** for reservoirs. The method has been used in Australia with encouraging results. Texas is losing almost as much water by evaporation as it uses each year.

• Heating equipment **manufacturers** polled by Minneapolis-Honeywell are **not expecting** conventional fuels for homes to feel competition from **atomic or solar heat** before 1965.

• Backlogs of **industrial construction** are approaching the **highest levels** since the early part of the Korean war, T. C. Williams, president of the National Constructors Association said in a year-end statement. Projects now under contract assure a high volume for all of 1956.

• Manufacturers' shipments of **room air conditioners** increased by 5% in 1955 to 1,290,000 units, while retailers' inventories decreased 50% resulting in an **overall 30% increase** in retail movement, according to ARI.

• **Heavy construction** in 1955 was 30% ahead of 1954, and industrial and commercial building contracts both set records in December.

WASHINGTON OVERTONES

by LORING OVERMAN

Continued good business for 1956—possibly a little better than 1955—is the overtone guiding Washington planners and observers as the new year dawns.

The rate of business growth is not expected to equal that of '55, for the current year starts from a near-capacity level. Business totals, however, are expected to make 1956 "our **best year** for total economic activity."

As Congress prepared to convene on January 3 there were words of caution, but none of pessimism. Despite political differences of opinion on other topics, Washington seems agreed that 1956 carries **built-in stabilizers,** and that any possible loss of business altitude would be shortlived.

It would seem safe for members of the air-conditioning, heating and ventilating industries to make plans on that premise.

The election year legislative program will be particularly sensitive to the vote-getting possibilities of each action proposed in House and Senate. Such being the case, the No. 1 piece of business on the desk of each businessman should be **close contact with Members of Congress.**

Through trade associations, Chambers of Commerce and citizens' groups, business and industry is fairly well agreed on its legislative goals. Achieving them will require a combination of individual and organizational effort on such subjects as these:

- **Tax revision.** Some reductions seem politically expedient. Lower income groups (because they are so numerous and swing so many votes) are favored. Nevertheless, official tax study groups concede that **business deserves a break** if it is to continue risking capital to create new jobs and income. Tax-writers may need to be reminded of the goose and golden egg.
- **Road program.** Business generally seems agreed that the highway tie-up is an emergency requiring federal attention. A 90-10 percent split between federal and state highway financing, instead of the present 50-50, is proposed. Continuation of state control is desired by business; financing methods to be determined later.
- **School construction program,** of direct interest to air conditioning, heating and ventilating industries, is another highly controversial subject. Same goes for proposed health program, including larger grants for hospital construction.
- **Housing program.** Continued assistance to home builders, slum clearance projects. Business guidance needed on such questions as how far to go and when to stop.
- **Wage-Hour law extension.** Proposals to extend coverage would affect some 5.2 million persons "engaged in activities affecting interstate commerce."

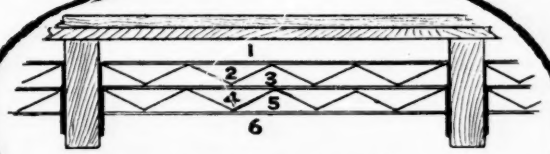
The foregoing, among others, are the topics on which Congress will act, and soon. How it acts will depend upon what instructions are received from constituents. In this instance, "silence gives consent" to the position of the opposition.

In its mid-December Second Annual Press Symposium on the **Business Outlook for 1956,** the U. S. Chamber of Commerce asked five panels of experts to discuss prospects for the year ahead. Subjects covered were transportation, construction, distribution, manufacturing, and agriculture and food. Of direct interest to air conditioning, heating and ventilating folks:

- **Construction.** General consensus—in most lines, '56 will exceed '55, itself a record year. Total for '56, approximately $44 billion (3 to 5% above '55).
- **Public construction,** up 10% to $13 billion—principally for educational facilities, highways, sewers and water systems.
- **Private construction,** up 3% to $31 billion.
- **Residential building,** possibly down by 100,000 starts to 1.1 million. Better construction likely—**repair and modernization** up.
- **Non-residential building,** up 12 to 15%; **new plant construction** up again by 17% over 1955.

(*Continued on page* 8)

WHO SAID AIR IS FREE?



THIS AIR IS FREE!

Numbers 1 to 6 are air spaces

Were it not for Radiation and Convection, empty air spaces inside walls, roofs, etc. would be the best insulation. But why pay costly labor and storage bills for handling "free" air entrapped **before** it is used in bulky insulation? Bulky materials also require more freight cars, trailers and trucks. The "free" air is paid for over and over again.

Multiple accordion aluminum envelops large volumes of air and creates layers of air spaces **only** as it is opened when finally stapled in place. This air is **really** free.

With respect to radiant heat flow, the aluminum sheets have 97% reflectivity, and 3% absorptivity and emissivity. Low conduction results from the preponderant air spaces of low density. The layers of multiple aluminum and fiber retard inner and outer convection. The tough aluminum sheets are almost impervious to vapor flow. Infiltration under flat stapled flanges is slight. Condensation formation on or within is minimized by the scientific construction of multiple layers of joist-to-joist, full-depth* accordion aluminum, fiber, and air spaces. *Patent applied for.

Multiple accordion aluminum as it comes compactly from package contains very little air.
As installed creates multiple layers of "free" air.

MILLION SQ. FT. IN ROOM 12' x 13' x 13'

Because of the low volume of unopened, practically airless multiple aluminum, an ordinary passenger auto will easily hold 20,000 sq. ft. A railroad freight car, a huge interstate trailer, or a number of trucks would be needed to transport an equivalent amount of ordinary insulation.

The AMERICAN SOCIETY OF HEATING & AIR-CONDITIONING ENGINEERS has published a booklet which describes convection, conduction, and radiation heat flow through *ordinary* air spaces, and what happens when an ordinary building space is lined or subdivided by reflective metals, thus creating *reflective* air spaces. Ask us for a copy – it's free.

INFRA INSULATION, INC.
525 Broadway, New York, N. Y., Dept. V-1

☐ Please send ASHAE booklet "Insulating Effect of Successive Air Spaces Bounded by Bright Metallic Surfaces."

☐ Please send samples.

Name_____

Firm_____

Address_____

COST OF EDGE-TO-EDGE INFRA Multiple Aluminum Insulation installed in new construction between wood joists, material and labor

Type 6-PS about 10¢ sq. ft.
Type 4-PS about 8¢ sq. ft.

• **Commercial construction** up 14%; **religious** and **educational** up at least 10%; **farm construction** down; **electric light** and **gas** construction down moderately; **telephone** construction up 10%; **railroad** construction up 16⅔%.

• **Conclusion:** Because of the very size of the construction industry, it is likely that the economy as a whole will be prosperous **if building prospers,** even though there be contractions in a few spots.

• **Money and Credit** in '56. After numerous tightening actions in 1955 for the purpose of curbing inflationary trends, the year opens with considerable "elbow room" for monetary authorities to relax credit and encourage expansion if necessary.

"Thus," concludes the U. S. Chamber symposium, "the **prospects for 1956 look good.** Some phases of the economy may encounter difficulties; others will expand. But it will be a highly political year. Fortunately, our decentralized economic and political system is fairly durable. It has a lot of built-in stability because of its checks and balances, inumerable centers of decision-making and diffusion of power. We predict that it will survive the coming onslaught—perhaps a little battered and weary, but not for keeps."

• **Goverment expenditures, 1956.** As industry's biggest "customer," the Government and its annual budget is always a factor in business forecasts. The U. S. Budget is expected to be in balance for 1956, due principally to the fact that revenues, reflecting expanded business, are higher than estimated. **Defense expenditures** for '56 are expected to be **no higher** than in '55 (approximately $35 billion—down $10 billion from the 1953 peak). A **moderate decline** in other national government expenditures is expected for 1956, and even if new and costly highway and school programs are authorized, increases would not affect the budget until very late in the year.

Observers expect, therefore, that Government expenditures will exert a relatively neutral effect on the business economy in the year ahead.

More and better **business statistics** are in prospect if Congress acts favorably on the recommendation of a Congressional Joint Economic Subcommittee. The recommendation followed studies made by committee members, and by five consultant committees established by the Federal Reserve Board.

The subcommittee was particularly insistent that **studies of construction** be expanded. "In any appraisal of the economic outlook, it is essential to know as much as possible about this (building) industry," said the committee report. The committee also suggested more statistics on busines plant and equipment expenditure expectations; savings, and surveys of consumer and business expectations. Statistics on employment, and shifts in patterns of employment were also recommended.

• **The wedding of CIO and AFofL** is causing business and government to take an extremely respectful look at the new force. A Congressional Joint Economic Subcommittee which investigated the **effect of automation** on industry and labor had a word of caution for both in its official report.

• **Management**—"must be prepared to accept the human costs of displacement and retraining as charges against the savings from the introduction of automation."

• **Labor**—"should continue to recognize that an improved level of living for all cannot be achieved by a blind defense of the status quo."

• **All**—"these hearings have been the first Congressional recognition of this important postwar trend called automation, which has had and promises to continue to have great effect upon our lives and the operations of the economy in the future."

The committee voiced its views in a series of 11 official recommendations, the final one urging continuing study of a problem "by no means negligible or settled."

Possibility of a **shortage** of both industrial and residential **fuel oil** is being watched with concern by Washington and industry. Increasing demand for both products is one cause of the dwindling reserve. The other is the switch by some refiners to production of more profitable items—petroleum coke and asphalt.

Situation is developing despite increases in **crude oil production.** During the second week in December, for example, daily production averaged 6,922,500 barrels, up 86,500 over the previous week. Daily flow for the corresponding week last year was 6,341,200 barrels.

Pacific Telephone & Telegraph Company used

WROUGHT IRON PIPE for this Radiant Heating System

This radiant heating system, serving 22,500 square feet of floor area in Pacific Telephone & Telegraph Company's new warehouse at San Leandro, California, is an excellent example of the Company's insistence on durability. More than 16,300 feet of corrosion-resistant wrought iron pipe was used to safeguard the system against premature failure and costly repair.

The system, planned and designed by PT&T's Engineering Department, features some interesting construction details employed to protect the floor against damage from heavy fork-lift trucks and impact caused by bouncing reels of cable. After the 10-inch structural slab was poured, wrought iron pipe coils were laid in place. Over the pipe coils, a wire mesh was stretched to strengthen the concrete "topping" slab, and contribute to more even heat distribution. Then the pipe and mesh were covered with 3 inches of concrete. A metallic floor hardener was applied to the surface.

Architects for the project were Thomsen & Wilson, San Francisco. The system was designed by Harry S. Haley, San Francisco Consulting Engineer, in collaboration with Pacific Telephone & Telegraph Company engineers. The installation was made by Scott Co., Bay Area Mechanical Contractors.

Wrought iron pipe is ideally suited for this service because of its ease of installation, dependability in service. It takes short radius bends, without springback. It produces sound welds, free from pin-hole leaks. Its uniform structure assures sharp, full-depth threads. And because of its mechanical strength, wrought iron pipe withstands damage during installation. In service, wrought iron stays on the job longer, costs less per year.

Our bulletin, *Wrought Iron Pipe for Radiant Heating*, gives complete details, documents service records. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N. Y.

Available throughout the world.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY STEEL PRODUCTS

BRIEFLY STATED

• Appointment of Richard W. Smith as director of advertising of the American Air Filter Co. has been announced. Mr. Smith will be directly responsible for the advertising activities of all eight sales divisions of the company which includes air filters, dust control equipment, unit ventilators for schools and a complete line of heating and ventilating equipment. John McConnell will continue to serve as vice president in charge of advertising. Smith, for the past five years, has served as an account executive for the Doe-Anderson Advertising Agency, Louisville. Prior to joining Doe-Anderson he served in a similar capacity with the Griswold Eshleman Company of Cleveland.

• Cory Corporation has purchased all capital stock of The Mitchell Manufacturing Company, headed by B. A. Mitchell, president. Purchase price was not disclosed but assets of the Mitchell company were estimated to be in excess of $3 million. The Mitchell company will continue to operate as it has in the past, but as a wholly-owned subsidiary of Cory.

• The appointment of John F. Karr as manager of market research has been announced by The Trane Company, La Crosse, Wis. Mr. Karr has previously been engaged in market research in Detroit. He was graduated from Wayne University, and received his master's degree from Indiana University.

• Fairbanks, Morse & Co. has announced the appointment of Henry J. Barbour as manager of advertising and public relations for the company. He succeeds L. A. Harlow who has resigned to join an advertising agency. Mr. Barbour has been associated with Fairbanks, Morse & Co. for thirty-one years, having held numerous positions both in the firm's Beloit, Wisconsin, works and the executive offices in Chicago.

• E. N. Foss has been appointed manager and P. J. Zilles, sales manager, of the newly-created air cleaning products department of the Sturtevant Division, Westinghouse Electric Corp., Hyde Park, Mass. Mr. Foss, a graduate of Harvard, has been with Westinghouse since 1934 when he joined the company's student training course at Sturtevant. Mr. Zilles, a graduate engineer from the University of Missouri, joined the Westinghouse student training course in 1925.

• Wagner Electric Corp., St. Louis, Mo., recently announced the appointment of Paul C. Ford as chief engineer of its Electrical Division to succeed C. P. Potter who is retiring after more than 46 years with the Wagner organization. Mr. Ford joined Wagner Electric as a student engineer in 1937.

• The first contracts for starting construction of the new processing plant for the American Gilsonite Co. near Grand Junction, Colorado, to produce coke and high-test gasoline from Gilsonite mineral have been awarded to the Foster Wheeler Corp. of New York City, and Kaiser Engineers of Oakland, Calif.

• American Radiator & Standard Sanitary Corporation has announced that its wholly-owned subsidiary, Kewanee-Ross Corporation, has been dissolved and that two new American-Standard operating divisions have been formed to continue Kewanee-Ross operations. The two new divisions are the Kewanee Boiler division and the Ross Heat Exchanger division. W. B. Russell, president of Kewanee-Ross Corp., has been named president of the new Kewanee Boiler division. E. M. Palmer, vice president of Kewanee-Ross, will become executive vice president of Kewanee Boiler division. John C. Linsenmeyer has been named president of the Ross Heat Exchanger division, with Richard S. Reade as executive vice president. Mr. Linsenmeyer is president of American Blower Corp., also a division of American-Standard. He will continue to serve in that position as well as president of the Ross Heat Exchanger division. Mr. Reade has been director of purchases of the Plumbing and Heating Division of American-Standard.

• H. Leigh Whitelaw, formerly managing director and secretary of GAMA, has been elected to the newly created office of executive vice president. Mr. Whitelaw will concentrate on policy matters, industry and governmental relations, and will serve as advisor to the board of directors. Harold Massey was named managing director and elected secretary of the Association. Mr. Massey, who has been assistant managing director since 1946, now assumes the positions formerly held by Mr. Whitelaw.

• City folks are not the only ones who appreciate the comfort of air conditioning. The November issue of Farm Journal magazine tells about a Kansas farmer who built an air-conditioned cab for his tractor from used refrigerator parts and an old water tank. To reduce vibration, he re-mounted the fender platform on rubber, then used it as part of the cab. The cooling compressor runs off a V-belt pulley on the belt wheelshaft, and a car heater fan pulls air through a cooling filter just above the windshield. I spend 800 hours every summer on that tractor, the farmer said, and I figured I might as well be comfortable.

• Edgar B. O'Hora has been appointed manager of air conditioning, refrigeration and internal sales, a newly created post, for General Electric's Small Integral Motor Department, Fort Wayne, Ind. A native of Auburn, N. Y., Mr. O'Hora came to Fort Wayne in 1953 as the department's manager of advertising and sales promotion and held that post until his new assignment.

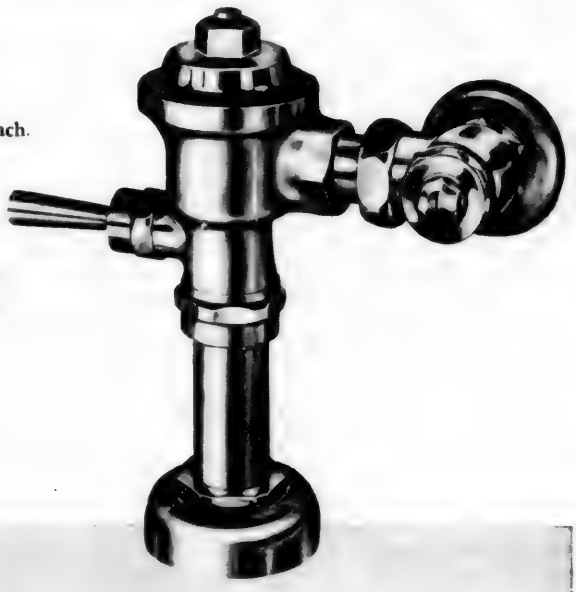
• The 1500th American Standard has been approved. This is double the number of American Standards in national use in 1948. The standard was submitted to the ASA by the American Society for Testing Materials. It is the American Standard Specifications for Nickel-Chromium-Iron Alloy Seamless Pipe and Tubing, H34.3-1955 (ASTM B167-49T).

• Douglas S. Sterner has rejoined General Controls Co., a leading manufacturer of automatic controls, after a year's absence as district manager for Typhoon Air Conditioning Co., in Atlanta, Ga. Mr. Sterner has been named manager of the General Controls air conditioning-refrigeration division with headquarters at the executive offices in Glendale, Calif.

(*Continued on page* 12)

And in Miami Beach– A FUTURE OF FAULTLESS SERVICE

Elegance unsurpassed is a modest description of the gleaming Eden Roc, newest and most splendid addition to the Gold Coast of Miami Beach. Soaring fourteen stories above the surf, this $10,000,000 COYNE & DELANY installation has been called "the most luxurious vacation quarters ever built." A cabana club, a yacht anchorage, and even an escalator to the beach will all add to guest convenience here. In each of the four hundred plus guest rooms – most spacious on the beach – the irritation of undesirable noise has been overcome by the selection of COYNE & DELANY diaphragm type flush valves with patented "Turn-to-Silence" equipment. Where service requirements are high, look for DELANY – "the fastest growing name in flush valves!"



EDEN ROC HOTEL
Miami Beach, Florida
MORRIS LAPIDUS
architect
SASNETT ENGINEERING INC.
mechanical engineer
MIAMI STATION INC.
plumbing contractor
ALL STATE PIPE SUPPLY CO.
wholesale distributor
KOHLER CO.
plumbing fixtures manufacturer

This new "HAND BOOK and CATALOG No. 53" is the most comprehensive of its kind—designed for everyday reference . . . 19 pages of installation details for exposed, concealed and special FLUSH VALVE installations . . . over 75 blue prints . . . cut away views . . . many pages of charts, formulae, piping details . . . sent free, if requested on firm letterhead.

COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK

IN CANADA: THE JAMES ROBERTSON CO., LTD.

DELANY *Flush* VALVES

Since 1879

BRIEFLY STATED

(*Continued from page* 10)

• The merger of Typhoon Prop-R-Temp Corp. of Florida with The Hupp Corp. of Detroit, Michigan, is announced by E. L. Garfield, Typhoon's president. The Florida concern, located in Tampa, manufactures heat pumps for commercial and residential heating and air conditioning. Prop-R-Temp's business will be conducted under its present name as a Division of Hupp, and the present management of Mr. Garfield and James F. Dailey will operate this Division, the statement added.

• A. L. Caney has been made general sales manager of Tuthill Pump Co., Chicago. Before joining Tuthill, Mr. Caney was district representative in the middle west for Diamond Chain Co. and earlier was assistant manager of engineering sales for the Crane Co. prior to service with the Air Force during the Korean war.

• United States Air Conditioning Corp., of Minneapolis, has purchased the 72-year old Floral City Heater Co., of Monroe, Mich. The move marks the entry of usAIRco into the warm air heating field and heralds an increased sales effort by the company in all phases of the residential air conditioning market. The Floral City firm manufactures a complete line of gas and oil-fired residential warm air furnaces, as well as combination home heating and cooling units, all under the trade name Flo-Co. Floral City Heater will be operated as a division of usAIRco and will retain all of its personnel.

• For the first 10 months of 1955, the shipments of residential oil burners, oil-fired boilers and furnaces totaled 704,116 units; up 10.2% over the same period in 1954, reports the Market Research Department of Oil-Heat Institute of America, Inc. It is expected that total shipments for the year will run over 800,000—one of the biggest volume years for the industry.

• The Lennox Furnace Company has changed its name to Lennox Industries, Inc.

• Bruce D. Henderson has been named operating vice president and division manager in charge of the air conditioning division of the Westinghouse Electric Corp. At the same time, John A. Gilbreath, who has been manager of the plant at Staunton, Va., will become manager of the packaged products department of the division, a new position which carries responsibility for the production and marketing of essentially all the products manufactured at the Staunton plant.

• Donald E. Hawk has been appointed sales manager of the steel boiler department of Burnham Corporation, Irvington, New York, the company has announced. Mr. Hawk was formerly associated with Preferred Utilities Manufacturing Co., covering the Metropolitan New York area, and with the Fitzgibbons Steel Boiler Company. He is a graduate of Pennsylvania State College and a member of Tau Beta Pi honorary engineering fraternity. His activities with the Burnham Corporation will be concentrated on sales and development of Burnham's steel boiler line.

• Combustion Engineering, Inc. has contracted for the purchase of a 530-acre site in Windsor, Connecticut, on which it will build a Nuclear Engineering and Development Center. The Center will comprise facilities for the complete design and development of nuclear power reactors, for the construction of reactor cores, and for the manufacture of related atomic fuel elements.

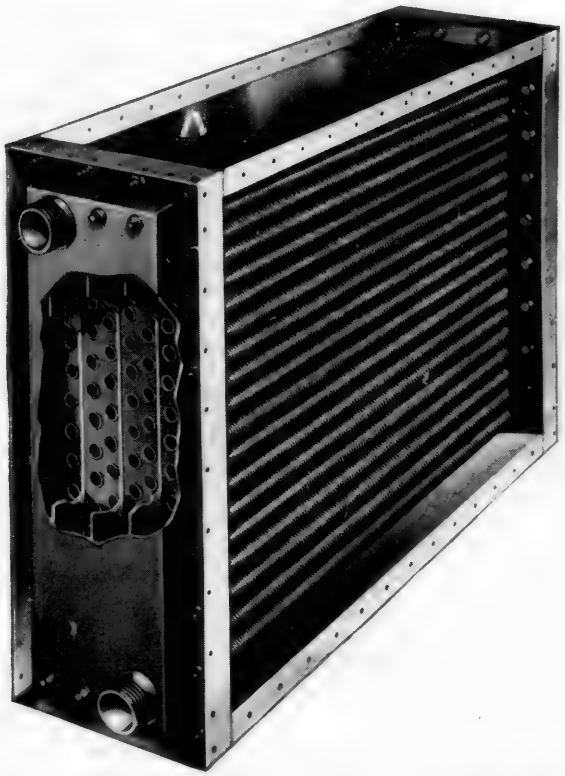
• Appointment of Herbert K. Kingsbury as manager of product sales, centrifugal pump section, Allis-Chalmers Norwood Works, has been announced. Kingsbury joined Allis-Chalmers in 1943 after receiving his mechanical engineering degree from Marquette University. He had been an application engineer in the firm's West Allis Works before transferring to Norwood Works in 1952.

• Appointment of Clarence Wantz as chief engineer of Robertshaw Thermostat Division of Robertshaw-Fulton Controls Co. has been announced. Mr. Wantz developed the first practical timer controls for top burners of gas ranges which were introduced last year. The automatic shut-off controls, utilizing an elementary principle of physics, represented the solution to a problem that perplexed the gas industry for 25 years. He became associated with the Robertshaw-Fulton organization in 1952.

• Robert J. Moore has been appointed sales manager, packaged products, for the Westinghouse Electric Corporation's air conditioning division at Staunton, Va. He will be responsible for the sales activities of all Westinghouse residential and commercial packaged air cooling and heating units and heat pumps. Mr. Moore, who has been with Westinghouse appliance division since 1948, comes to his new position from Los Angeles where he has served as Pacific Coast district manager for consumer products. He has also served the company in various sales capacities in Seattle, Salt Lake City and San Francisco.

• Edwin J. Kurek, former chief Multi-Vent engineer for the Pyle-National Company, Chicago manufacturer of air diffusing and electrical equipment, has been appointed regional manager for the company's 13-state north central region. Before joining Pyle-National in 1949, Mr. Kurek was employed at the Greyhound Corporation as an air conditioning engineer. He is a graduate of the Illinois Institute of Technology and holds a Bachelor of Science degree in mechanical engineering. He serves on the technical advisory committee of ASHAE.

• W. G. Frank, formerly executive vice president, has been named president of the American Air Filter Co. and W. M. Reed has been elevated from president to the newly created post of chairman of the board. Also elected were Ben R. Shaver from secretary-treasurer to vice president and treasurer, and E. G. Mason from assistant secretary-treasurer to secretary. Mr. Frank came with American Air Filter when it was organized in 1929 through a consolidation of five air filter companies. He was formerly chief engineer with the National Air Filter Co., Chicago, one of the companies in the merger. With AAF he became associated with the Dust Control Division and was named assistant manager. Later he was appointed assistant to the president and in 1948 he was made executive vice president. Mr. Reed was the founder of the Wm. Reed Engineering Co. in 1922. Later its name was changed to Reed Air Filter Co. and it was one of the firms involved in the consolidation. He has been president of AAF since its organization.



AEROFIN TYPE R REMOVABLE-HEADER WATER COILS

- **Complete Drainability**
- **Easily Cleaned**
- **High Heat Transfer**

Completely drainable and easily cleaned, Aerofin Type "R" coils are specially designed for installations where frequent mechanical cleaning of the inside of the tubes is required.

The use of 5/8" O. D. tubes permits the coil to drain completely through the water and drain connections and, in installations where sediment is a problem, the coil can be pitched in either direction. The simple removal of a single gasketed plate at each end of the coil exposes every tube, and makes thorough cleaning possible from either end.

The finned tubes are staggered in the direction of air flow, resulting in maximum heat transfer. Casings are standardized for easy installation.

Write for Bulletin No. R-50.

AEROFIN CORPORATION

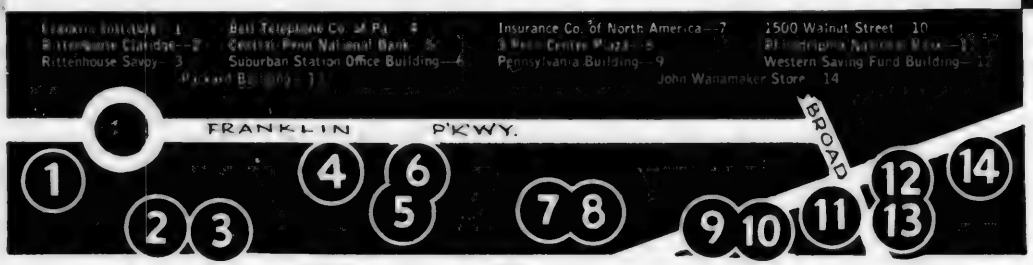
101 Greenway Ave., Syracuse 3, N. Y.

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

MAGNIFICENT PENN CENTER

—where nearly a score of buildings demonstrate a "new concept" of air conditioning with Yorkaire Systems!

Exciting 3 Penn Center Plaza nears completion —the first new office building to be erected in Philadelphia's fabulous Penn Center redevelopment area!



Now 30-three more hotels have chosen York!

York brought the right kind of air conditioning *to the Empire State Building, Cincinnati's Netherland-Plaza Hotel and to 27 of Miami Beach's largest, newest hotels. Denver's new Mile High Center, San Francisco's new Equitable Life Assurance Society Building and the striking new Colgate-Palmolive Building in New York have Yorkaire Systems, too. Famous York companions to 3 Penn Center Plaza are shown on the map above.*

Also the Connecticut General Life Insurance Co., the Congress Hotel, Rockefeller Center, Inc., the Ford Motor Co. and Atlanta's Fulton National Bank!

↑ Add Lumbermen's Mutual Insurance Co., Atlantic Refining Co., etc.

York refrigeration air conditioning

the quality name in

YORK CORPORATION HEADQUARTERS FOR

JDS — this is a swell ad, but can't we include the other jobs I've listed? — L.Q.

ARCHITECT— EMERY ROTH & SONS
OWNER AND BUILDER — URIS BROTHERS
GENERAL CONTRACTOR — CAULDWELL-WINGATE CO
MECHANICAL CONTRACTOR — RAISLER CORP

Superb new 3 Penn Center Plaza features two compact 800-hp. York Turbo Water Cooling Systems located in the basement. They provide the cooling for 1200 Model CF Yorkaire Conditioners in the individual rooms.

The ability to meet rigid specifications, to bring the *right kind* of air conditioning to a building—and to do it all at a reasonable price—appeals strongly to our first-time customers. They call it a "new concept" of air conditioning.

This concept is dramatically illustrated in the Penn Center area. As in all large buildings, heat loads and glass areas and floor areas and numbers of occupants . . . economic considerations, taxes, depreciation and a score of other factors varied from building to building all around the Center. Obviously, no one system—or even two or three—could air condition all these buildings best. That's why York carefully selected and then precision-engineered each Yorkaire System to fit the air conditioning needs of the particular building in which it is installed.

Your building can have the right kind of air conditioning, too. Call your York District Office (listed in the classified phone directory of every major city). Or write directly to York Corporation, York, Pa.

air conditioning and refrigeration

MECHANICAL COOLING SINCE 1885

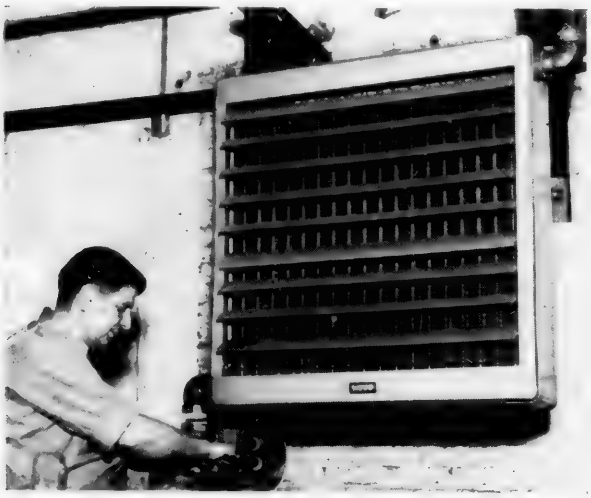
Dunham Heating-Cooling Units filter, heat, cool, ventilate and dehumidify air on individual room basis. No central system duct-work needed.

Your best move when you want to move air

...depend on Dunham Unit Heaters

Dunham Cabinet Unit Heaters . . . in capacities from 18,000 to 108,000 Btu. 7 different styles. Double end shaft motor with twin blower fans mounted on motor shaft.

Dunham Vertical Discharge Unit Heaters . . . in capacities from 30,240 to 576,000 Btu. Two models available. Four types of air diffusers.



Dunham Horizontal Discharge Unit Heaters . . . in capacities from 15,600 to 360,000 Btu. Two models available. Single two-speed, and multispeed motors.

Dunham Blower Unit Heaters . . . 17 different sizes in 170 ratings from 125,000 to 1,500,000 Btu.—1,430 to 20,800 c.f.m. Five types of mountings.

Depend on Dunham for unit heaters and you help yourself several money-saving ways. First of all, you get what you want . . . when you want it . . . from one source.

No matter which type of heater you need—Horizontal Discharge, Vertical Discharge, Blower, Cabinet or Heating-Cooling Units—you can find a model in the capacity range your job calls for. Dunham's line of steam and hot water unit heaters is complete, as shown above . . . looks good anywhere.

And all Dunham Unit Heaters have design features that simplify installation . . . construction features that make for minimum maintenance. Depend on Dunham to supply *all* your heating needs so that responsibility for your finished job rests on one manufacturer! For more detailed information, write for Bulletin ACHV-1 C. A. Dunham Company, 400 W. Madison Street, Chicago 6, Illinois.

DUNHAM®

HEATING & COOLING EQUIPMENT

RADIATION • CONTROLS • UNIT HEATERS • PUMPS • SPECIALTIES

C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

Luxurious new hotel shows how you can

Satisfy any client's most exacting indoor weather needs

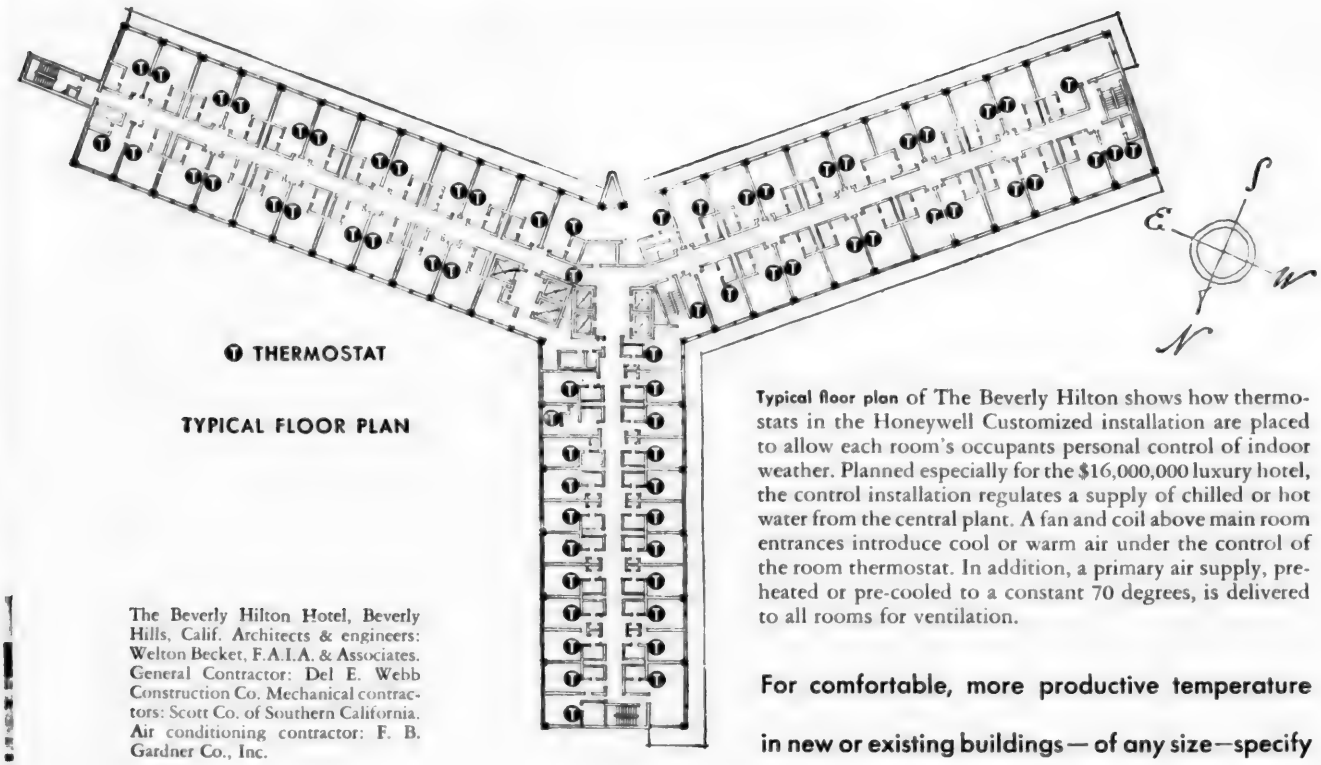
Honeywell Customized Temperature Control gives Beverly Hilton guests the climate of their choice in each of 450 rooms

FOR THE MOST modern kind of hotel, newest in Conrad Hilton's world-wide group, The Beverly Hilton's planners chose the most advanced type of temperature control installation: Honeywell Customized.

"Customized" is the key word here. It means that a Honeywell Customized Temperature Control installation is designed to fit the needs of the building and its occupants—in heating and cooling, in ventilating and humidity control.

In The Beverly Hilton, a completely air-conditioned luxury hotel, guests are assured comfort suited to their individual requirements; each simply dials his own choice of indoor weather.

Only Honeywell can provide true "customized" control. Because only Honeywell manufactures all three types of controls—pneumatic, electric and electronic.



The Beverly Hilton Hotel, Beverly Hills, Calif. Architects & engineers: Welton Becket, F.A.I.A. & Associates. General Contractor: Del E. Webb Construction Co. Mechanical contractors: Scott Co. of Southern California. Air conditioning contractor: F. B. Gardner Co., Inc.

Typical floor plan of The Beverly Hilton shows how thermostats in the Honeywell Customized installation are placed to allow each room's occupants personal control of indoor weather. Planned especially for the $16,000,000 luxury hotel, the control installation regulates a supply of chilled or hot water from the central plant. A fan and coil above main room entrances introduce cool or warm air under the control of the room thermostat. In addition, a primary air supply, preheated or pre-cooled to a constant 70 degrees, is delivered to all rooms for ventilation.

For comfortable, more productive temperature in new or existing buildings—of any size—specify Honeywell Customized Temperature Control

Whatever the building, Honeywell Customized Temperature Control can help solve your clients' problems of heating, ventilating, air conditioning and industrial control. At the same time you can give them more comfort, more efficiency, more economy.

For full details on Honeywell Customized Temperature Control, and economical Maintenance Plan, call your local Honeywell office. Or write Honeywell, Dept. HV-1-157, Minneapolis 8, Minnesota.

Luxurious appointments are exemplified by this sitting room of a typical Beverly Hilton suite. Modern *comfort* is provided by the Honeywell Customized Temperature Control installation, which includes a conveniently located thermostat in every room. Once the guest dials the temperature he likes, the thermostat keeps the comfort level constant—despite heat gained or lost through floor-to-ceiling windows.

Conrad N. Hilton, president, Hilton Hotels Corporation, says: "Among the features that make our new hotel completely modern is a Honeywell Customized Temperature Control installation that allows each guest to select his own comfort preference. This is in keeping with the Hilton tradition of providing our guests with every comfort facility."

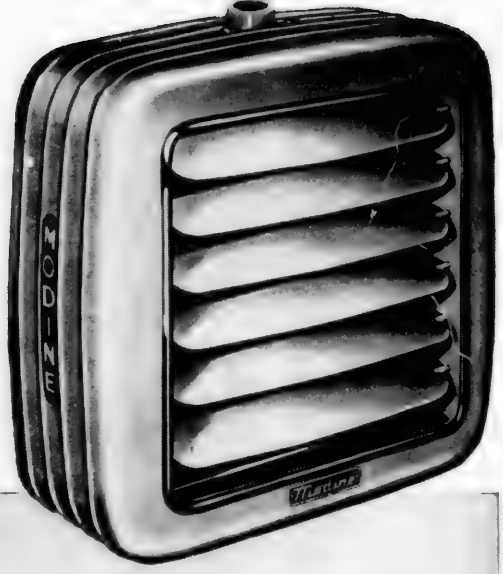
MINNEAPOLIS
Honeywell

Customized Temperature Control

112 offices across the nation

When you want the best in unit heating...

Look for the name MODINE

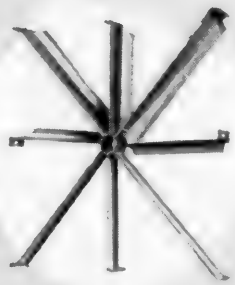


Like so many well-known, pioneer names . . . Frigidaire, Victrola, Kodak . . . "Modine" is commonly used as a descriptive word to identify all makes of steam and hot water unit heaters. But — if it doesn't carry the MODINE nameplate, *it is not* a Modine Unit Heater.

Only unit heaters designed and built by Modine give you all the performance and operating advantages which have made Modine the first name in unit heating for over a quarter century. And continuing research and development are your assurance that Modines will always be your best buy for heating comfort and economy.

More comfort per fuel dollar

Discharge air temperatures of 110° to 120°F are correctly related to air velocities, assuring perfect heating comfort plus lower fuel costs.

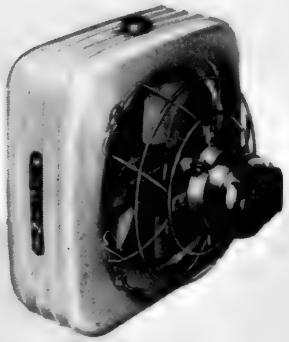


Greater heat throw

No one but Modine provides a built-in velocity generator that effectively steps up heat throw . . . assures positive heat penetration of cold air strata near floor.

A model for every need

Modine horizontal delivery models for steam and hot water are built in two distinct types (blow-through and draw-through) and 36 different capacities. A unit for every application.



Sturdy built-in fan guard

Safety fan guard of steel rod stock offers constant protection. Also serves as resilient motor mount, absorbing and dissipating fan vibration.

Modine Vertical Unit Heaters are offered in 26 different models, each with choice of 4 types of air deflectors. New light weight cuts installation costs.

SU-1286

Want the complete story?

For details on why Modine offers you the best in unit heating . . . more value, less trouble — contact the representative listed in your classified phone book. Or, ask for Catalog 155. Write to Modine Mfg. Co., 1511 DeKoven Ave., Racine, Wisconsin.

Modine UNIT HEATERS

SETTING THE PACE
IS TRADITIONAL WITH COPELAND

'Way back when we first announced the COPELAMETIC, its potential was recognized quickly by refrigeration people. The original "accessible hermetic" enjoyed immediate acceptance, because it filled a practical need. We're complimented that it "sets the pace" for others to follow.

Basic ingredient for engineering progress is to know what's needed. Copeland has done that by working closely with manufacturers, dealers and users. We've lived with your problems. We're convinced that it pays off for everyone.

Now, Suction Cooling Extends Range of Air-Cooled Units for Air Conditioning

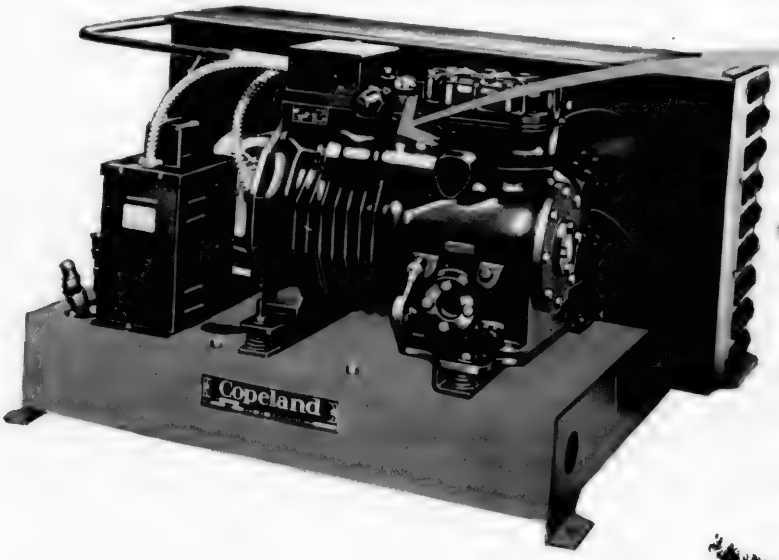
One of the frequent problems in the rapidly expanding, central air conditioning market has been water requirements. At Copeland we met this difficulty head on, and our answer is in condensing units with suction-cooled motor-compressors in sizes through 5 H.P.

The Copelametic line includes a range of smaller size units using the principle of suction cooling. They afford greater flexibility of installation, since no water is needed. Now the larger sizes make possible even wider applications.

The new 2, 3 and 5 H.P. suction-cooled Copelametics are designed especially for air conditioning and other high suction pressure installations. Oversize, finned-tube condensers on these models insure maximum efficiency in high ambient temperatures.

New specification sheets on Copelametic suction-cooled motor-compressors and condensing units give all the facts. Send for your copies TODAY.

Copeland
DEPENDABLE *Electric* REFRIGERATION



THIS MAKES THE DIFFERENCE

MODEL ZR-300H
Air-cooled unit with Suction-cooled Copelametic motor-compressor

COPELAND REFRIGERATION CORPORATION • SIDNEY, OHIO

Bay Shore Shopping Center, Milwaukee, Wisconsin. Owned by Bay Shore Center, Inc.; Architect—M. O. Nathan; Builder—Sheldon-Thomas, Inc.; G-E

Wisconsin shopping center comfort with 664 tons of G-E

Larger Bay Shore stores utilize up to four G-E units. Smaller stores require only a single G-E unit of 3 to 15-ton capacity. Offices are serviced by units grouped in central machinery rooms.

81 G-E Packaged Air Conditioners permit individual indoor weather control in 47 stores, 60 offices of Bay Shore Shopping Center in Milwaukee

Every office and store of mammoth (315,000 square feet) Bay Shore Shopping Center, largest in Wisconsin, developed by C. M. Redman, is "comfort serviced" by 81 G-E Packaged Air Conditioners. All units, totalling 664 tons, are located out-of-space — not a single square foot of sales or office space is lost.

Installations were made on a highly flexible, individual basis as the center grew and as leases were signed. Working closely with the architect, the G-E contractor coordinated air conditioning with building design and layout — meeting (1) changes in plans with minimum inconvenience and delay;

packaged units installed by Conditioned Air Equipment Co., Minneapolis, Minn.

gets year-round Air Conditioning

(2) the special needs of each lessee at minimum cost to Bay Shore management.

Throughout hot weather, each store and office controls its own indoor temperature and humidity. Ductwork and grilles are used both summer and winter. For winter heat, some units have heating coils. Write for data to General Electric Company, Commercial & Industrial Air Conditioning Department, 5 Lawrence St., Bloomfield, New Jersey.

Packaged AIR CONDITIONERS

Progress Is Our Most Important Product

GENERAL ELECTRIC

CHECK THESE ADVANTAGES OF USING G-E PACKAGED AIR CONDITIONERS

- Low installation, low operating costs.
- Complete line of vertical floor-mounted and horizontal ceiling-fastened units gives the architect maximum design freedom. Units can be used in space or concealed, with or without ducts. Horizontal units are both air cooled and water cooled.
- 3, 5, 7½, 10 and 15-ton units can be used singly or in multiple to meet air conditioning needs of any building.
- Easily directed air flow for no-draft no-waste air circulation.
- Built and factory assembled by General Electric. 5-year warranty covers entire sealed cooling system.

Bay Shore Shopping Center, Milwaukee, Wisconsin. Owned by Bay Shore Center, Inc.; Architect—M. O. Nathan; Builder—Sheldon-Thomas, Inc.; G-E

Wisconsin shopping center comfort with 664 tons of G-E

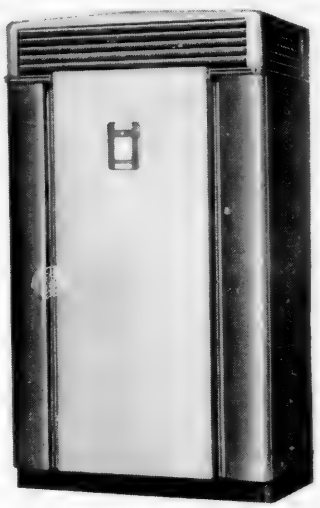
Larger Bay Shore stores utilize up to four G-E units. Smaller stores require only a single G-E unit of 3 to 15-ton capacity. Offices are serviced by units grouped in central machinery rooms.

81 G-E Packaged Air Conditioners permit individual indoor weather control in 47 stores, 60 offices of Bay Shore Shopping Center in Milwaukee

Every office and store of mammoth (315,000 square feet) Bay Shore Shopping Center, largest in Wisconsin, developed by C. M. Redman, is "comfort serviced" by 81 G-E Packaged Air Conditioners. All units, totalling 664 tons, are located out-of-space — not a single square foot of sales or office space is lost.

Installations were made on a highly flexible, individual basis as the center grew and as leases were signed. Working closely with the architect, the G-E contractor coordinated air conditioning with building design and layout — meeting (1) changes in plans with minimum inconvenience and delay;

packaged units installed by Conditioned Air Equipment Co., Minneapolis, Minn.



gets year-round Air Conditioning

(2) the special needs of each lessee at minimum cost to Bay Shore management.

Throughout hot weather, each store and office controls its own indoor temperature and humidity. Ductwork and grilles are used both summer and winter. For winter heat, some units have heating coils. Write for data to General Electric Company, Commercial & Industrial Air Conditioning Department, 5 Lawrence St., Bloomfield, New Jersey.

Packaged AIR CONDITIONERS

Progress Is Our Most Important Product

GENERAL ELECTRIC

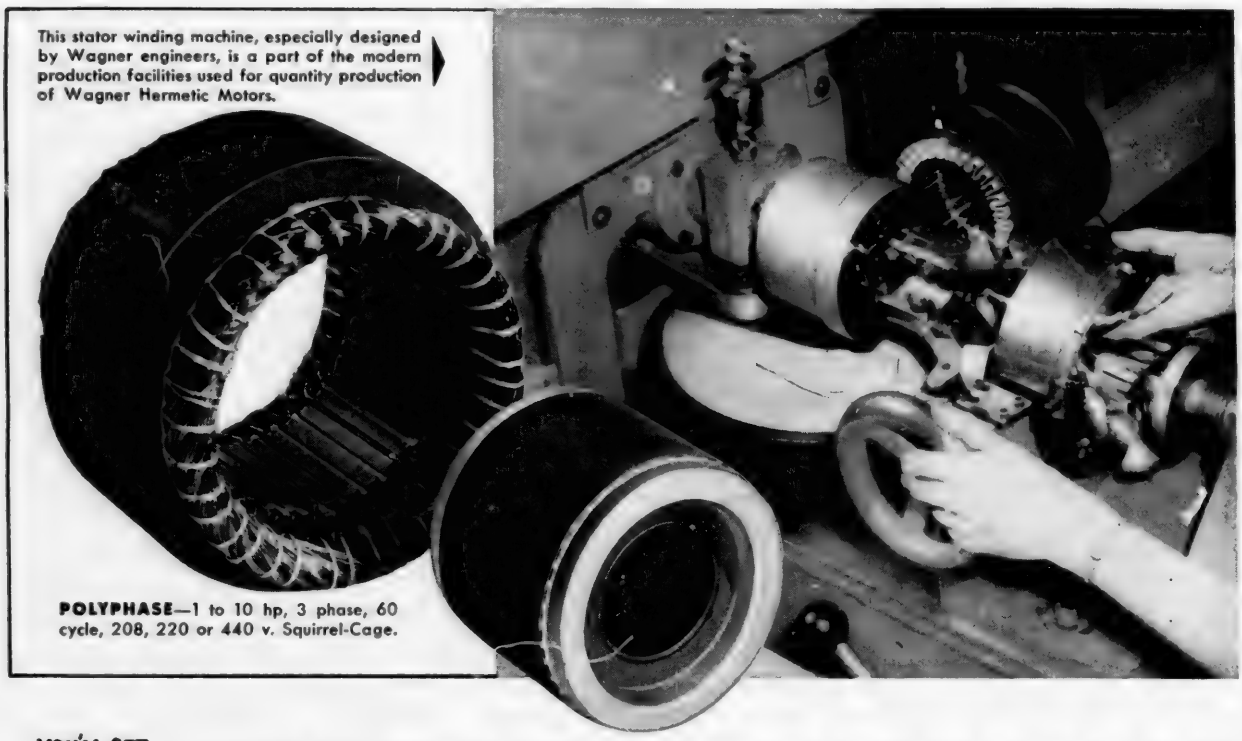
CHECK THESE ADVANTAGES OF USING G-E PACKAGED AIR CONDITIONERS

- Low installation, low operating costs.
- Complete line of vertical floor-mounted and horizontal ceiling-fastened units gives the architect maximum design freedom. Units can be used in space or concealed, with or without ducts. Horizontal units are both air cooled and water cooled.
- 3, 5, 7½, 10 and 15-ton units can be used singly or in multiple to meet air conditioning needs of any building.
- Easily directed air flow for no-draft no-waste air circulation.
- Built and factory assembled by General Electric. 5 year warranty covers entire sealed cooling system.

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

Design a Wagner Hermetic Motor into your next sealed unit

This stator winding machine, especially designed by Wagner engineers, is a part of the modern production facilities used for quantity production of Wagner Hermetic Motors.



POLYPHASE—1 to 10 hp, 3 phase, 60 cycle, 208, 220 or 440 v. Squirrel-Cage.

YOU'LL GET ... carefully built, thoroughly tested, performance-proved motors that you can seal for life!

Wagner hermetic motors, like all Wagner motors, are known for their ability to give years of trouble-free service. Wagner hermetics are built on modern production lines—with the newest, finest production tools available. Repetitive surge and dielectric tests are given to every Wagner hermetic motor stator. Every rotor that goes into a Wagner hermetic motor is given an individual speed test.

Such exacting manufacturing techniques and quality control enable us to provide you, the manufacturer, with hermetic motors that will give years and years of dependable service ... motors on which you can safely stake the reputation of your product.

When your motor drives are to be hermetically sealed, it's to your advantage to specify Wagner for use on your equipment. Get the facts ... call the nearest of our 32 branch offices or write us.

POLYPHASE		SINGLE-PHASE	
TYPE	RATINGS	TYPE	RATINGS
NP, Squirrel-Cage	1 to 10 hp, 3 phase 60 cycle, 208, 220 or 440 v.	NB—Split-Phase NK—Capacitor-start induction run NY—Capacitor-start and run	¼ hp, 60 cycle, 115 v. ¼ to ¾ hp, 60 cycle, 115 or 230 v. ½ to 5 hp, 60 cycle, 230 v.

SINGLE-PHASE
¼ to 5 hp, 60 cycle, 115 or 230 v. Split-Phase. Capacitor-start induction run. Capacitor-start and run.

Wagner Electric Corporation
6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

H56-2

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

THE MARK OF QUALITY

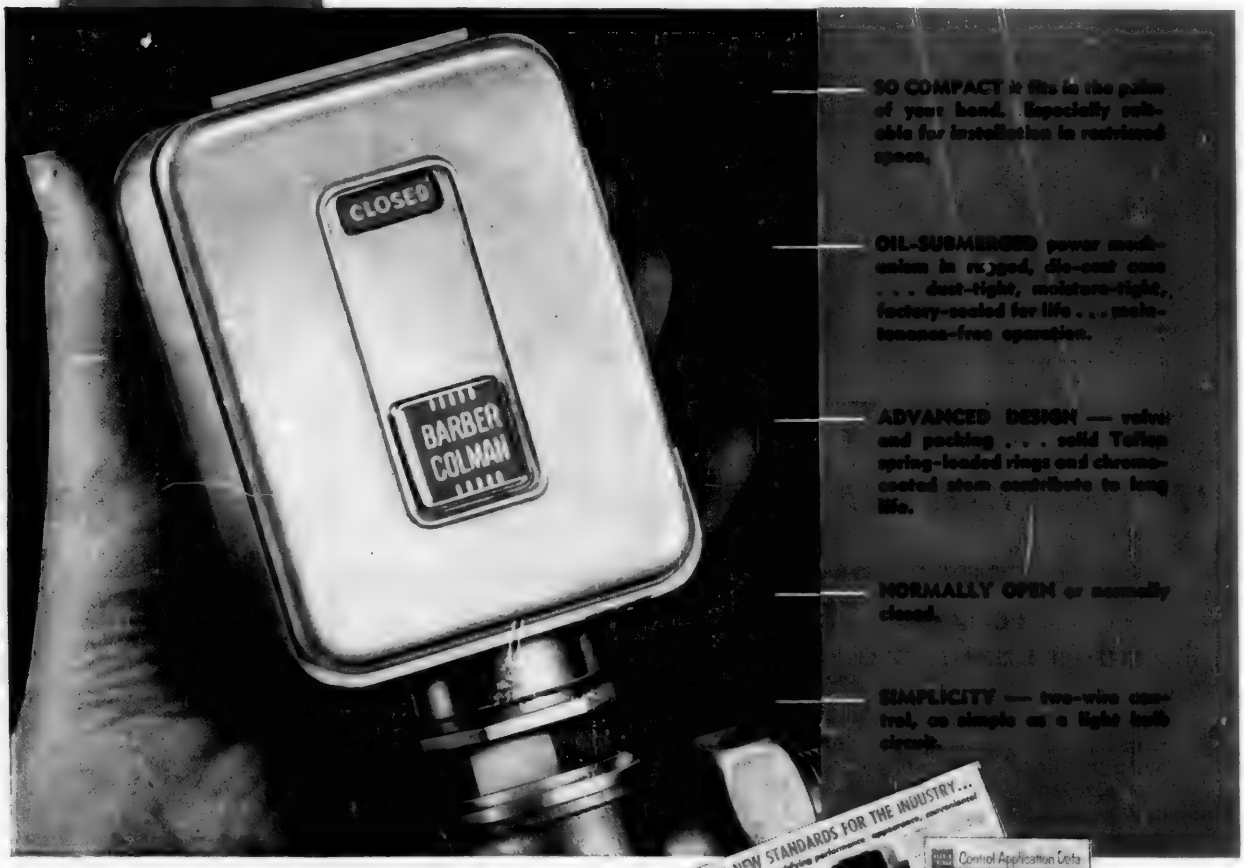
BARBER COLMAN

ELECTRIC-ELECTRONIC

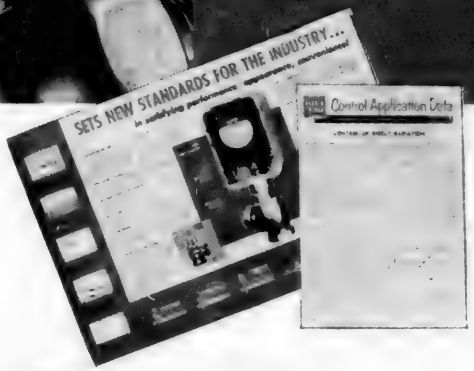
Automatic Controls

New... compact... motor-operated valve!

Here's your simplest, most economical way to control convectors, radiators, unitary air conditioners . . . using hot water, low-pressure steam, or chilled water. It's the new, field-tested, extremely compact, motor-operated Barber-Colman valve which is making news throughout the industry. Look at these years ahead features:


CLOSED
BARBER COLMAN
SO COMPACT it fits in the palm of your hand. Especially suitable for installation in restricted space.
OIL-SUBMERGED power mechanism in rugged, die-cast case . . . dust-tight, moisture-tight, factory-sealed for life . . . maintenance-free operation.
ADVANCED DESIGN — valve and packing . . . solid Teflon spring-loaded rings and chrome-coated stem contribute to long life.
NORMALLY OPEN or normally closed.
SIMPLICITY — two-wire control, as simple as a light bulb circuit.

Now you can recommend simplified, effective, *individual room control* for schools, offices, hospitals, apartments, hotels, motels, etc. This compact new valve can be installed throughout new or existing buildings, or in just a room or a floor at a time. Owners can expect substantial fuel savings, reduced decorating costs, satisfied tenants. Occupants will enjoy new controlled comfort in each room, contributing to health and efficiency. Get complete information now from nearby Field Office or write us.



YOU SHOULD HAVE this catalog and control application data. Phone your Barber-Colman Field Office or write us for Bulletin F-6801 and Control Application Data CA-12.

Barber-Colman Company

DEPT. A, 1302 ROCK STREET
ROCKFORD, ILLINOIS, U. S. A.

FORT BROWN MEMORIAL CENTER, Brownsville, Texas, million-dollar monument to lasting friendship between the U. S. and Mexico. Designed by Wiltshire & Fisher, Dallas, winners of A.I.A. competition.

Consulting Engineer: Landauer & Shafer, Dallas. General Contractor: Marchant Bros. & Balay, Mercedes, Tex. Air Conditioning Contractor: John H. & Earl Hunter, Brownsville, Tex.

IT'S AIRTEMP AIR CONDITIONING IN PRIZE-WINNING FORT BROWN *memorial center*

HERE'S MORE EVIDENCE OF TREND TO AIRTEMP AMONG LEADING U. S. ARCHITECTS!

Airtemp air conditioning is *famous* for trouble-free performance—just the smooth-running result you'd expect from 21 years of advanced engineering by Chrysler. And when you install Airtemp, you're giving your clients the best assurance of low operating costs—year after year.

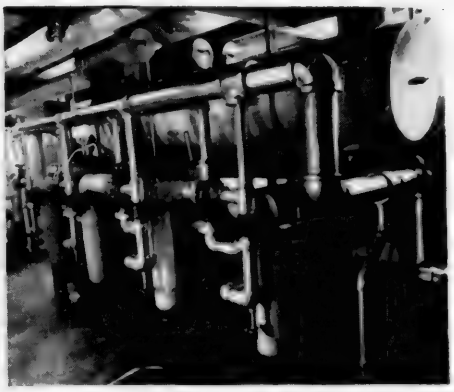
Whether your job is large or small, in the complete Airtemp line of equipment for all systems of modern air conditioning, you will find the *exactly right* equipment for every requirement.

When you air condition with Airtemp you can make *doubly* sure that your installations are right in every detail by utilizing the advisory services of *top engineers* of Airtemp Construction Corporation. And to safeguard your installations through the years ahead, there are Airtemp-trained *personnel* and service *facilities* right on the spot in every major community.

So remember, next time you're planning commerical or industrial air conditioning . . . specify AIRTEMP. Get the best equipment for the job *plus* the complete air conditioning service that will relieve you of many problems.

AIRTEMP BUILDS AIR CONDITIONING TO FIT ANY REQUIREMENT!

For full information on what Airtemp offers you, write to: Airtemp Construction Corporation, Dayton 1, Ohio



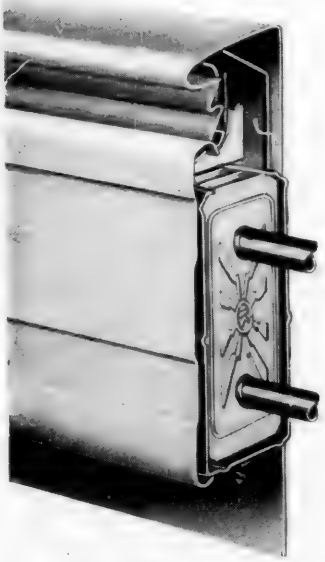
250 TONS OF COOLING! Two Airtemp Liquid Chilling systems provide water for cooling cycle in air conditioning of Fort Brown Memorial Center. Heart of each unit is the Airtemp Variable-Capacity Radial Compressor with exclusive design which saves space, reduces compressor weight. Quiet operation is due to perfect balance and reduced vibration.

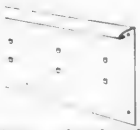
Airtemp
CONSTRUCTION CORPORATION
SUBSIDIARY OF CHRYSLER CORP.

AIR CONDITIONING • HEATING FOR HOMES, BUSINESS, INDUSTRY

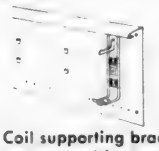
ONLY *Installed cost* tells the full profit story...
to give extra QUALITY with MOST PROFIT...

use KRITZER

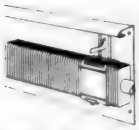




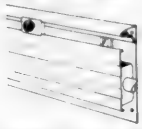
1. Heavy back plate nailed or screwed to wall.



2. Coil supporting brackets snapped into position.



3. Guide shoe slipped over coil. Laid in position on brackets.



4. Damper put in place. Front cover snapped on. Damper control snapped into position. NO SCREWS OR BOLTS USED AFTER BACK PLATE.

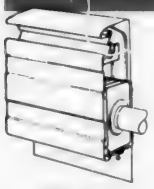
"K" LINE Radiant Baseboard

Naturally the basic cost of KRITZER Baseboard is slightly higher than ordinary baseboards. The best materials and workmanship are employed in its manufacture . . . and the "pre-fabricated" features provided by KRITZER engineering make "K" Line design layouts and installations the easiest and quickest of any baseboard. With installation time considerably reduced, highest quality heating installations are yours with a full profit margin and no higher price to your customer.

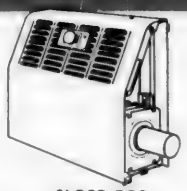
Users are always pleased with such KRITZER built-in features as the clean, modern appearance with safe, rounded corners and edges; the guide shoe which assures quiet operation and prevents damage to coils and eliminates "call backs"; and the efficient heating from laboratory tested KRITZER coils (ratings Certified).

For your protection all KRITZER products are guaranteed for materials, workmanship, and heating capacity. You can learn all about the "K" Line in BULLETIN 200. Write today to KRITZER RADIANT COILS, INC., 2901 Lawrence Ave., Chicago 25.

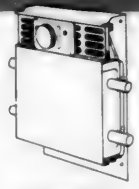
KRITZER QUALITY HEATING PRODUCTS



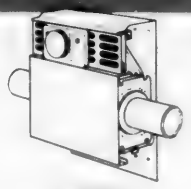
"K" LINE BASEBOARD



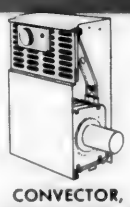
SLOPE TOP BASEBOARD



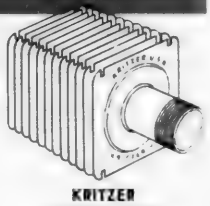
STANDARD BASEBOARD



UNIVERSAL BASEBOARD



CONVECTOR, SLOTTED FRONT



KRITZER FINNED TUBE

KRITZER

REPRESENTATIVES IN PRINCIPAL CITIES

SEE YOUR JOBBER FOR KRITZER PRODUCTS

"IF IT'S KRITZER, IT'S RIGHT, SIR!"

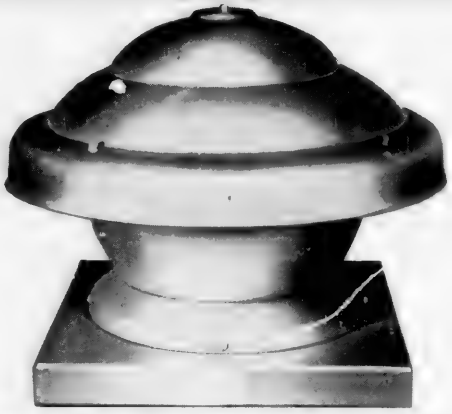
THE GUESSWORK IS GONE FROM ROOF VENTILATOR OUTPUT!

*Power Fan Manufacturers Association is an organization of leading manufacturers of air moving devices to establish standard methods of testing fan performance and sound, and to insure that this information is correctly presented to the public.

. . . IF YOU SPECIFY THIS LABEL

Now you can be sure that published roof ventilator output ratings conform with actual ratings . . . if you specify the P.F.M.A.* label! This label is your guarantee that the ventilator displaying it has been tested for output according to the standard code for centrifugal and axial fans by an impartial laboratory . . . and is in accordance with U. S. Department of Commerce commercial standards. For accurate and dependable ratings . . . be sure you specify . . . and get . . . ventilators with the P.F.M.A. label.

AND YOU'LL FIND IT ON CARNES VENTILATORS



MODEL CL—Modern, low-contour roof ventilator. Heavy gauge aluminum housing in attractive aluminum finish that maintains a neat appearance. Heavy duty ball-bearing motors, mounted on full-floating rubber vibration isolators for exceptionally quiet, smooth operation. Backwardly inclined, non-overloading centrifugal fans . . . expertly made and precision-balanced on the finest balancing equipment to provide highest capacity. Available in a wide range of sizes for the requirements of any building.

MODEL J—A new Carnes roof ventilator that combines low, streamlined construction and maximum efficiency. All aluminum spun housings that eliminate corrosion and maintenance problems are standard on all Model J Roof Ventilators. Freedom from noise and vibration is accomplished through the use of specially designed vibration isolators. This, high efficiency roof ventilator is available in sizes from 24″ through 48″ centifugal fan wheels.

For Complete Information, write

CARNES CORP.

VERONA, WISCONSIN

keep
milk
cowfresh
IN YOUR COOLER . . .
TYPE 435
TYPE TO
TYPE TCL
TYPE S1
FOR
ACCURATE TEMPERATURE
CONTROL . . . INSTALL
Alco
valves
CONTROLS FOR
EVERY COOLER
APPLICATION
SEE YOUR ALCO WHOLESALER
Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.
Write for
Catalog # 20
ALCO VALVE CO.
859 KINGSLAND AVE. • ST. LOUIS 5, MO.
6786

these "Extras" in CHICAGO PUMPS mean

Longer, Better Performance
Lower Cost Operation
and Installation

FLUSH-KLEEN Sewage Ejector TYPE "S"

The Flush-Kleen Sewage Ejector can't clog because only liquid is handled by the impeller. Coarse matter is strained out, then backwashed from the strainer into discharge pipes. No strainer baskets to clean, no repairs due to clogging, no foul basins because solids never reach the wet basin. Besides being easier to maintain, Flush-Kleens last longer and require less power. Write for details in Bulletin 122C.

DOUBLE SUCTION HORIZONTALLY SPLIT CASE PUMP

Accurately machined and fitted revolving parts in carefully cast casing. Have proved reliable for house pump, circulating and booster service. See Bulletin 101.

TYPE AVC CONDENSATION PUMP AND RECEIVER

Low inlet — no elaborate foundation needed for installation—for systems to 10,000 EDR and 10-30 psi. See Bulletin 245.

A COMPLETE LINE FOR EVERY BUILDING SERVICE

NEW F-C AND C-C PUMPS EITHER FLEXIBLE-COUPLED OR CLOSE-COUPLED

Compact, smooth running, quiet, — ceramic faced seal is highly resistant to wear — for circulating and booster service. Heads from 10 to 190 feet, capacities from 5 to 400 gpm. Bulletins 107 and 108.

SURE-RETURN CONDENSATION PUMP AND RECEIVER

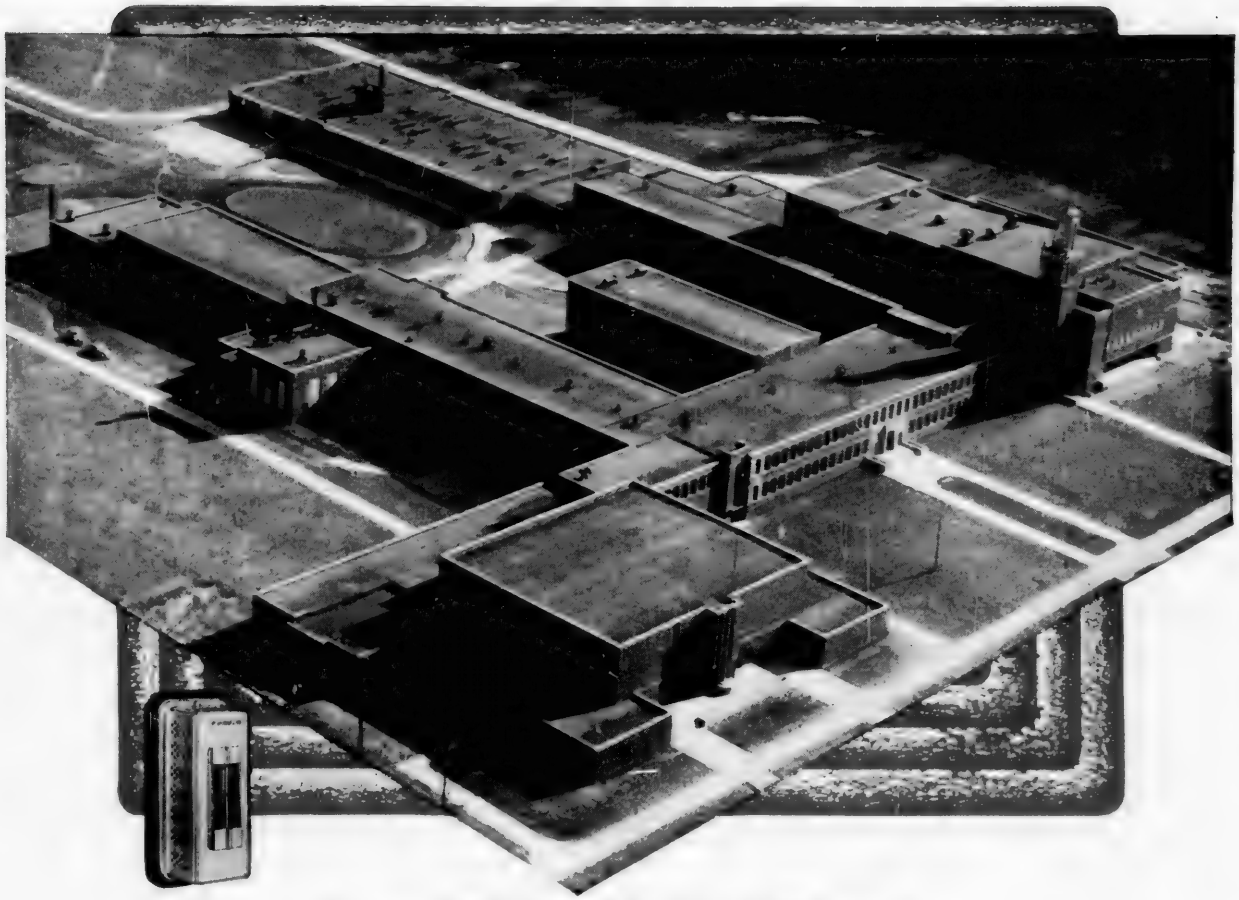
Low inlet — positive head on suction — no friction in manifold between pump and receiver—handles extremely hot condensate without steam binding — for systems to 75,000 EDR and low or medium pressures. See Bulletin 250.

For additional information on any of the above pumps, specify by bulletin number.

Write to Department B

fmc
CHICAGO PUMP COMPANY
Subsidiary of Food Machinery and Chemical Corporation
BUILDING PUMP DIVISION
622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems . . . Flush Kleen ® Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every industrial use.



Rate HEATING PLANT with JOHNSON CONTROL "Most Nearly Perfect"

Educational facilities at the new $5 million Senior High School* in Parma, Ohio, are widely acclaimed as among the nation's finest. Equally impressive are the building's mechanical features, notably its highly efficient heating and ventilating systems.

Comfort *could* be a real problem in this building. Its size alone creates special problems. So do the large number of rooms, which vary in area from little more than 100 square feet to more than 10,000 square feet. Other factors affecting comfort include the use and occupancy levels in such diversified locations as classrooms, offices, the 540-seat cafeteria and social center, the library, the 1,800 capacity auditorium and numerous others.

All of these problems, and more, are compensated for by a specially engineered system of Johnson Automatic Temperature Control which operates the heating and ventilating systems and insures ideal temperatures for every purpose.

Here's what George Rose, the school's engineer, has to say about it: "Our heating system is the most nearly perfect one I have seen. The automatic control system helps keep our fuel expenditures at a minimum. Yet it gives us the flexibility we need to satisfy all comfort requirements throughout the building. It also reduces the need for operating personnel and requires very little maintenance."

Any building—small or large, new or existing—can enjoy these same superior comfort and economy advantages of a Johnson engineered Control System. An engineer from a nearby Johnson branch will gladly discuss your temperature control problems and give you his recommendations without obligation. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

**Parma Senior High School, Parma, Ohio. Fulton, Krinsky & Dela Motte, architects; L. B. Mumma, mechanical engineer; The Feldman Brothers Company, heating contractor; all of Cleveland.*

JOHNSON CONTROL
TEMPERATURE AIR CONDITIONING

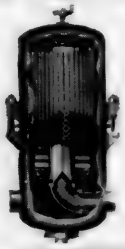
PLANNING • MANUFACTURING • INSTALLING • SINCE 1885

STAYNEW FILTERS

Dollinger makes ALL TYPES of filters as shown on this page, plus special filters for unusual filtration problems. New users of one specific type of Staynew filters often find a second Dollinger filter performs a great, added service in other processes or operations. Perhaps we can serve major or other filtration needs of your plant.

LIQUID FILTERS

Model HE (Sump) Liquid Filter Bulletin 330

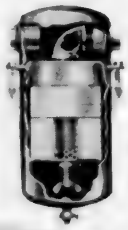


Model ELS (Pressure) Liquid Filter Bulletin 300

PIPE LINE FILTERS

Model CPH Pipe Line Filter Bulletin 200

Model CVH (Vacuum) Pipe Line Filter Bulletin 200



Model AAPHS (Absorption) Pipe Line Filter Bulletin 200

Model HPH and AHPH (High Pressure) Pipe Line Filter Bulletin 200

all types of FILTERS for every INDUSTRIAL NEED

AIR INTAKE FILTERS

Model IDR (Ground Level) Air Intake Filter Bulletin 100

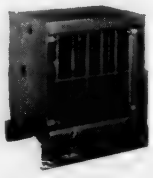
Model DS (Silencer) Air Intake Filter Bulletin 100

Model D (Outdoor) Air Intake Filter Bulletin 100

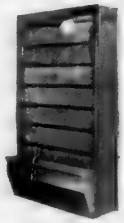
Model C (Indoor) Air Intake Filter Bulletin 100

VENTILATION FILTERS

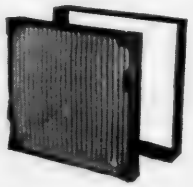
Electro-Staynew Mist Collector Bulletin 420



Electro-Staynew Precipitator Bulletin 400



Automatic Ventilation Filter Bulletin 500



Dry and Viscous Panel Ventilation Filters Bulletin 600 and 700

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

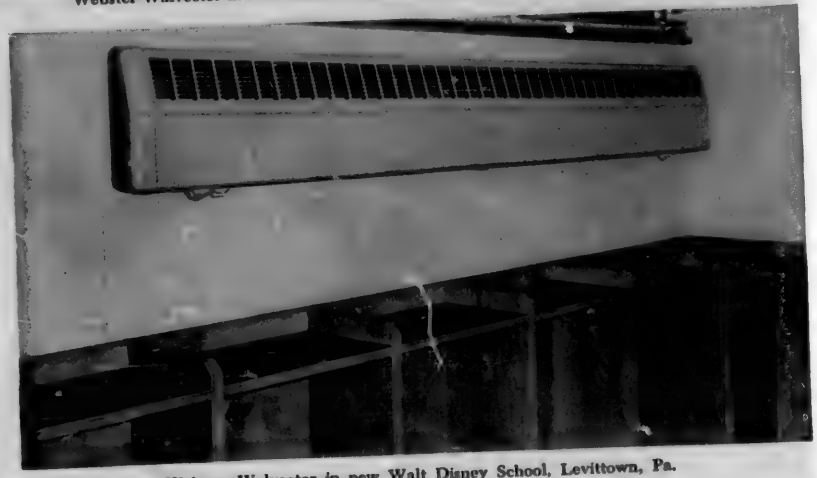
DOLLINGER CORPORATION CENTRE PK., ROCHESTER 3, N.Y.

Write, using Bulletin Numbers, for complete information on any of the Staynew filters illustrated. Consult Dollinger engineers on any special filtration problems—no obligation. Dept. 15 Centre Park, Rochester.

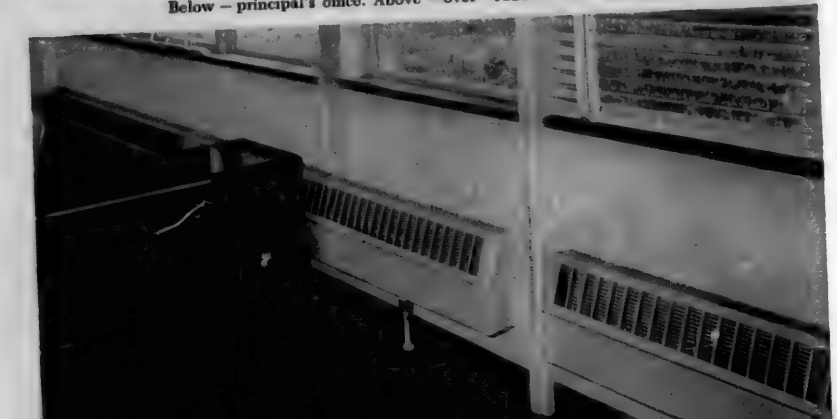
LIQUID FILTERS, PIPELINE FILTERS, INTAKE FILTERS, HYDRAULIC FILTERS, ELECTROSTATIC FILTERS, DRY PANEL FILTERS, VISCOUS PANEL FILTERS, LOW PRESSURE FILTERS, HIGH PRESSURE FILTERS, AUTOMATIC VENTILATION FILTERS, NATURAL GAS FILTERS, SPECIAL DESIGN FILTERS, SILENCER FILTERS

Turn here for the exciting word-and-picture story

Webster Walvector in new offices of Colonial Mortgage Service Co., Upper Darby, Pa.



Webster Walvector in new Walt Disney School, Levittown, Pa.
Below – principal's office. Above – over "cubbies" in cloak room.



New Beauty

In Tru-Perimeter Heating

Webster Walvector – first to extend Tru-Perimeter steam and hot water heating advantages into non-residential construction – now provides, in addition, new beauty together with increased ruggedness. Maintains the same ratings, same ease of installation, same savings in initial installation cost over conventional convectors. For details, see your Webster Representative, or write us.

Webster
WALVECTOR

WARREN WEBSTER & COMPANY, CAMDEN 5, NEW JERSEY

LOCATED NEAR YOU – TO HELP YOU. Webster Representatives in these 67 U.S. Cities: Albany, Atlanta, Atlantic City, Baltimore, Bethlehem, Birmingham, Boston, Buffalo, Butte, Chattanooga, Chicago, Cincinnati, Cleveland, Columbia, Columbus, Dallas, Davenport, Dayton, Denver, Des Moines, Detroit, Grand Rapids, Harrisburg, Houston, Indianapolis, Kansas City, Kingston, La Porte, Little Rock, Los Angeles, Louisville, Lubbock, Memphis, Milton, Milwaukee, Minneapolis, Nashville, Newark, New Haven, New Orleans, New York, North Hero, Oklahoma City, Omaha, Orlando, Philadelphia, Pittsburgh, Portland, Raleigh, Richmond, Rochester, Saginaw, St. Louis, Salt Lake City, San Antonio, San Francisco, Seattle, Spokane, Springfield, Syracuse, Toledo, Trenton, Tulsa, Washington, Wichita, Wilmington, Woodward . . . In Canada, Darling Brothers, L.d., Montreal.

By any other name it can't be the same

as a MARLEY Double-Flow Aquatower®

There is absolutely nothing like the Marley Double-Flow Aquatower in the intermediate capacity cooling tower field.

The name itself indicates the design and performance characteristics that make the Double-Flow Aquatower another Marley exclusive. "Double-Flow" denotes the use of patented Marley Double-Flow features developed for Marley industrial cross-flow towers. "Aquatower" suggests the trim appearance, low silhouette and compact design that is characteristic of Marley's famous packaged towers.

Years ahead in design when introduced several years ago, the Double-Flow Aquatower gained immediate professional acceptance. Engineers were pleased with its high performance . . . architects praised its low-silhouette . . . contractors appreciated the ease with which these towers can be constructed.

Today Double-Flow Aquatowers completely cover the water cooling front for intermediate capacity services. They are available in wood or steel structure with asbestos cement board casing and in single or multi-cell arrangements. Marley Application Engineers in any of 55 cities will gladly help you determine the sizes and models that meet your exact requirements.

MARLEY®

The Marley Company

Kansas City, Missouri

Pressman checks a final copy in controlled humidity of the press room.

Men and machines bring news to you

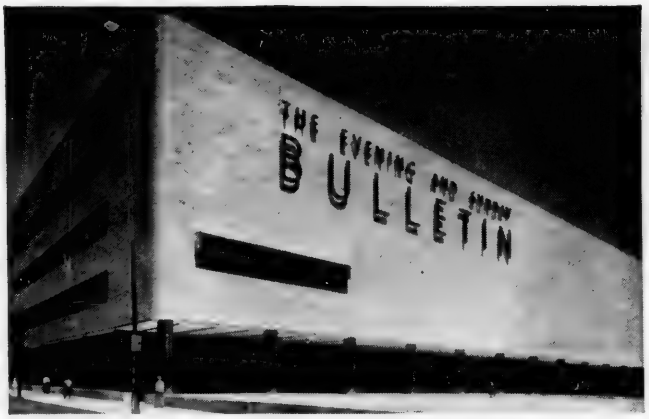
American Blower plays vital role in air conditioning one of the world's largest newspaper plants

At the new building of The Philadelphia Evening and Sunday Bulletin, gigantic newspaper printing presses reel off 210,000 newspapers an hour . . . in an atmosphere controlled by American Blower equipment.

A relatively high humidity in the press room is a must – for the speeding miles of paper could tear if too dry, and cause a delay. This added moisture, precisely controlled, also improves printing. The stereotype section, however – where lead printing plates are cast – calls for different treatment. Here, American Blower ventilating equipment works 'round the clock to rid the area of heat generated by the metal pots.

Considered by many as "the mechanical showcase of modern journalism," the new Bulletin Building requires varied air conditions throughout its over 500,000 sq. ft. area. For cooling, heating, ventilating, air filtering, humidifying, and dehumidifying – both men and machines depend on 78 American Blower units in the race of getting news to readers faster.

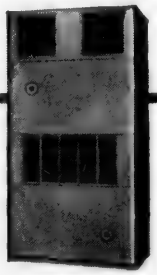
You can count on American Blower, too . . . whether your air-conditioning needs are large or small, normal or unusual. Just phone our representative near you.



New Bulletin Building. Architects: George Howe & Robert Montgomery Brown. Mechanical Contractors: Riggs Distler & Company, Inc. Special Consultants: William Ginsberg Associates. Consulting Engineers: A. Ernest D'Ambly; Pennell & Wiltberger; Keast & Hood.

In the section where printing plates are made, there is 'round-the-clock ventilation . . . to exhaust heat generated by the melting and casting of lead.

faster—thanks to conditioned air

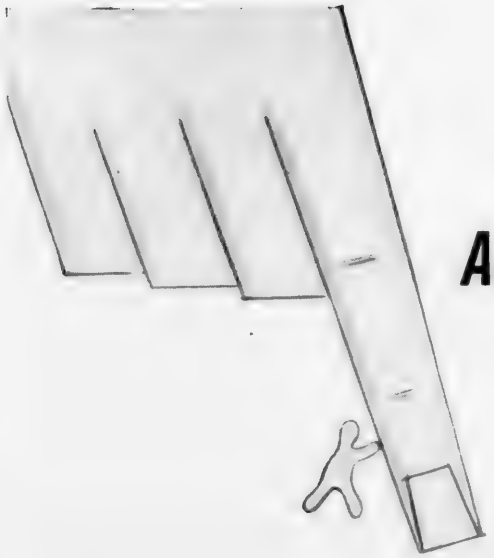


In addition to equipment for complete central systems—American Blower offers packaged air conditioners for offices, stores, industrial plants, and similar applications.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American-Standard

AMERICAN 75 BLOWER

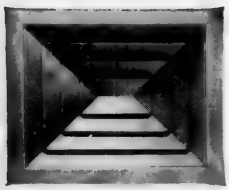
Air-conditioning equipment for every business



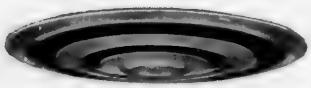
Put your finger on correct *AIR HANDLING* Equipment

AGITAIR®

for better air

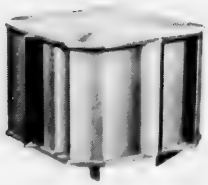


Square, Rectangular and Continuous Diffusers



Circular Adjustable and Non-Adjustable Diffusers

Stripline Sectional and Continuous Diffusers



Exhausters

High Velocity Air Filters

From drawing board to finished product, every AGITAIR is designed and built to provide dependable operation, maximum efficiency, minimum maintenance and years of continuous carefree service. And where AGITAIR engineering ends... AGITAIR technical service begins...to help you select the proper shapes and sizes to meet your particular requirements.

Contact your local AGITAIR representative— let him put your finger on the correct diffuser, filter or exhauster.

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

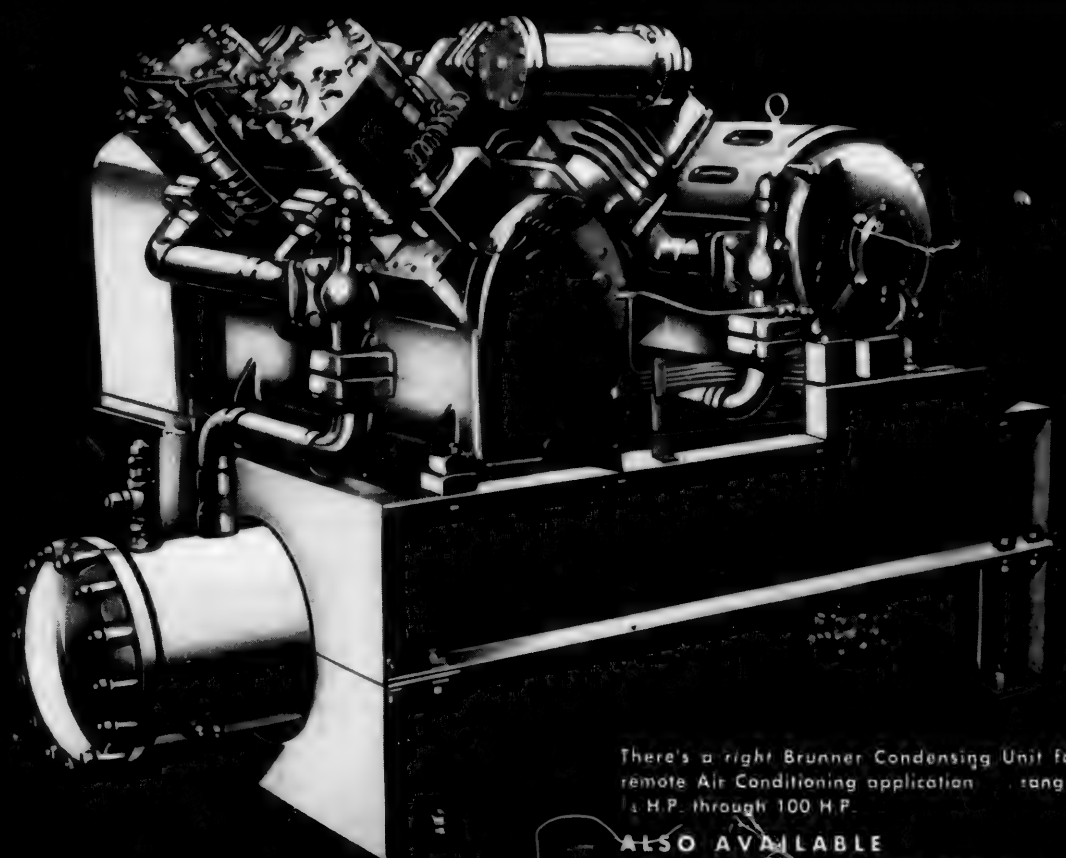
AIR DIFFUSERS • FILTERS • EXHAUSTERS

It was in 1906 that the first *Brunner-engineered* product appeared.

PROVEN QUALITY
50th Anniversary
BRUNNER
SINCE 1906
DEPENDABLE

TODAY... Brunner experience pays off in more sales for you...

provides the most complete line of Air Conditioning Condensing Units available from a single source!



There's a *right* Brunner Condensing Unit for every remote Air Conditioning application ranging from ½ H.P. through 100 H.P.

ALSO AVAILABLE

Newly designed BAC packaged units in 3, 5, 7½ and 10 H.P., finished in Hammertone Green

here's what heating and ventilating contractors say about INLAND TI-CO®

Galvanized Steel

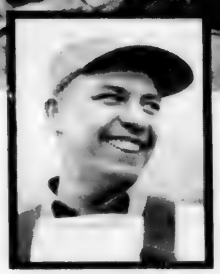
. . . says James N. Johnson, Shop Supt. of The Austin Sheet Metal Co., Chicago, Ill. "Ti-Co keeps our labor costs down! When you're the sheet metal contractor for large housing projects involving hundreds of homes, such as the Brynhaven development in Elmhurst, it's necessary to keep a large inventory of fittings in stock. Mass production of sheet metal fittings can be costly if you're having trouble with cracking and flaking of the "iron". That's why we like Inland's Ti-Co. We never have to waste time and money doing an intricate fitting over again because Ti-Co's coating never comes off."

. . . says P. W. Olmen, President of Jamar-Olmen Co. and W. A. Kuechenberg, President of R. B. Hayward Co., co-contractors of the sheet metal work on Chicago's new Prudential Building. "We used Ti-Co exclusively for all the duct work for air handling in the Prudential Building. Over 1,000 tons went into the job in all . . . the largest single air handling sheet metal job ever undertaken in Chicago. With Ti-Co we knew we could depend on getting uniformity of coating and base metal."

. . . says Maurice L. De Wulf, heating contractor of Roselle, Illinois. "Ti-Co Galvanized sheets cut my fabrication costs 20 to 25%! Figure for yourself what it costs to form a 10-foot heating duct with a Pittsburgh lock seam. Then if the zinc coating flakes or peels along the seam—*just double the cost!* The job has to be done over, and though you may be able to salvage some of the material, you can't salvage those wasted man-hours."

. . . says Mr. Earl Rocky, Supt. of O. A. Wendt Co., Chicago, Ill. "I wouldn't use anything but Ti-Co in my shop. We have been using close to 500 tons of Inland Ti-Co per year for the past several years and I have yet to have a sheet flake on me. Even on the lockseamer, and we make our seams especially tight, Ti-Co performs beautifully. Ask any of the boys in my shop and they'll tell you the same thing."

. . . says H. G. Prizant, Owner and Manager of H. G. Prizant Co., Chicago, Ill. "We depend on Ti-Co for our profit. Take this intricate installation in the new University of Illinois Dentistry Building, for example. Although the galvanized steel cost less than $10, there was probably about $250 worth of labor in this piece. If the sheets cracked along the lock seams, or even if their zinc coating had flaked off severely, it would have meant re-doing the entire job. With Ti-Co we don't have to worry about re-doing jobs because of steel failure."



. . . says Fred Rickey, Supt. of F. R. Inskip & Co., Champaign, Ill. "Ti-Co Galvanized sheets save us 50¢ a sheet. We used to waste a lot of time and material with conventional galvanized before they were ready for pattern layout. We lost about ten minutes shop-time on the shear and about a pound of metal. Then we had to refigure the sheet size to make a layout. We don't have this waste using Inland Ti-Co sheets. They're always uniform. We make layouts and shear Ti-Co as delivered. And we save at least $2,500 a year."

Yes, more and more sheet metal contractors throughout the middle west are learning the tremendous difference between Ti-Co and just any conventional galvanized sheet. Inland Ti-Co is made by a special continuous galvanizing process which eliminates the brittle iron-zinc layer that causes conventional galvanized coatings to flake.

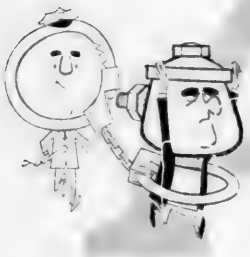
Ask your dealer for Inland Ti-Co and look for this stencil on all your galvanized sheets.

INLAND STEEL COMPANY

38 South Dearborn Street • Chicago 3, Illinois

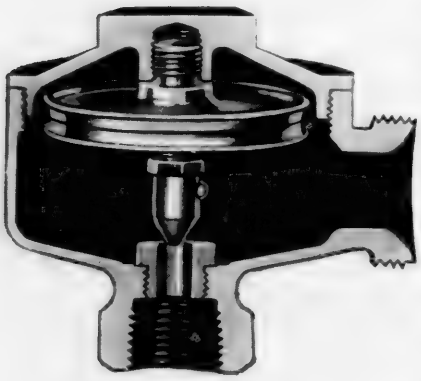
Sales Offices: Chicago • Milwaukee • St. Paul • Davenport St. Louis • Kansas City • Indianapolis • Detroit • New York

Question: *Are your radiator traps stealing steam?*



Answer: *Yes! If you continue to use traps that are steam-wasting and ineffective. Better check them now!*

Discard your inefficient traps and install **illinois** Replacement Traps to get top radiator efficiency.



FACTORY ADJUSTED, FACTORY TESTED, FACTORY GUARANTEED FOR SENSITIVE AND ACCURATE OPERATION.

Illinois Replacement Traps are not attachments, adapters, or interior assemblies, (the installation of which require time-wasting fitting in present traps with questionable results) but are complete traps the interior parts of which are identical with the nationally famous Illinois Series G radiator traps.

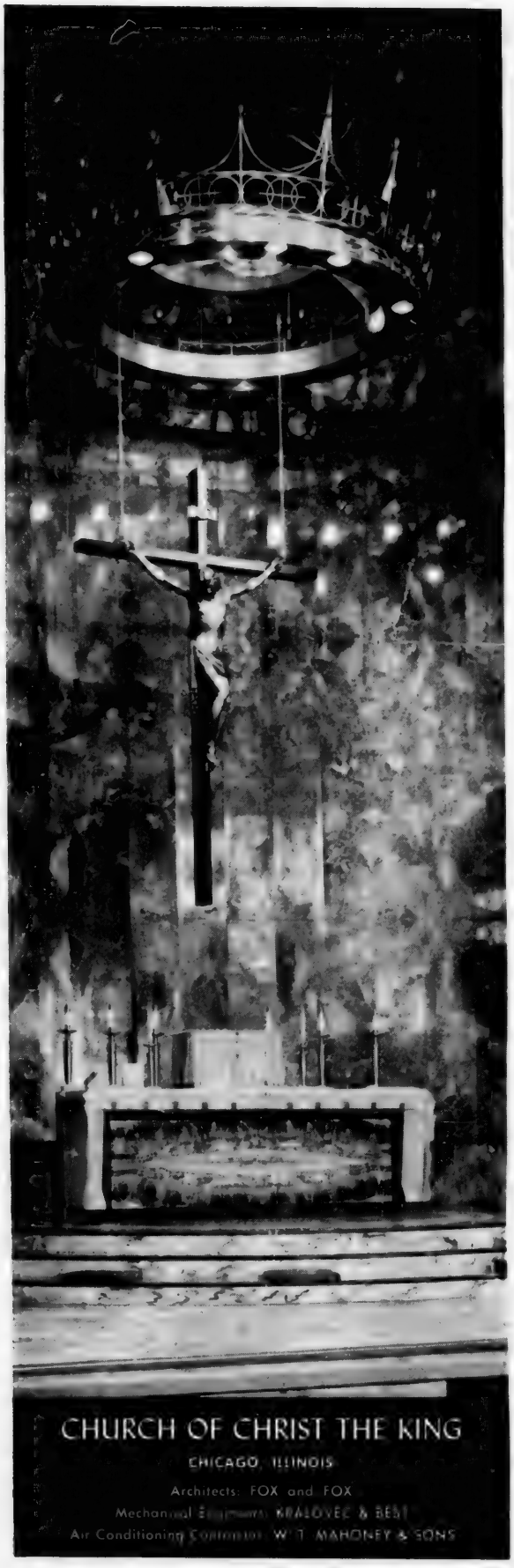
Made in a variety of patterns with roughing-in dimensions to fit practically all makes of traps. They are made to fit your present lock nut and tail piece. Your contractor can install them with minimum labor expense.

EASY TO ORDER—EASY TO INSTALL. TRAPS CARRIED IN STOCK FOR IMMEDIATE SHIPMENT.

Consult the representative nearest you in our nationwide service or write for descriptive literature.

illinois ENGINEERING

ILLINOIS ENGINEERING COMPANY • 2045 SOUTH RACINE AVENUE • CHICAGO 8, ILLINOIS
DIVISION OF AMERICAN AIR FILTER COMPANY, INC.



CHURCH OF CHRIST THE KING

CHICAGO, ILLINOIS

Architects: FOX and FOX

Mechanical Engineers: KRALOVEC & BEST

Air Conditioning Contractor: W. T. MAHONEY & SONS

Why More and More

Air Conditioned Churches

Are Controlled by POWERS

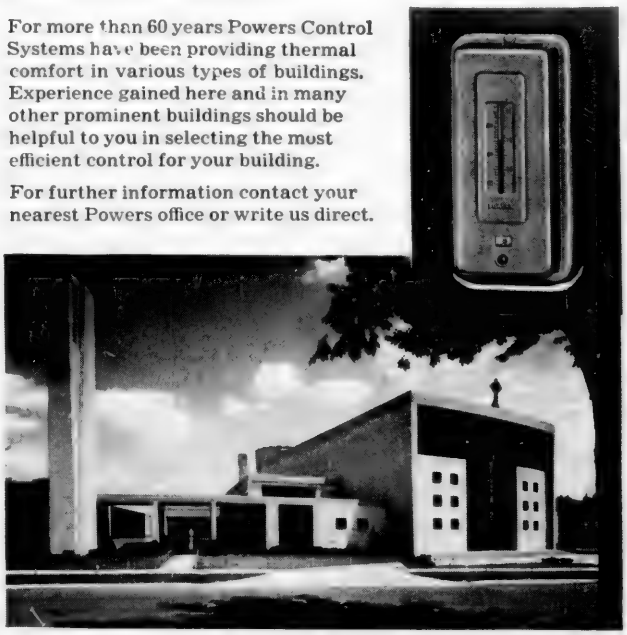
POWERS

Year 'round AIR CONDITIONING Control System

used in this distinguished modern church helps provide these important benefits: (a) light and airy appearing church due to use of large glass areas, without penalties of cold drafts or excessive solar heat; (b) people attending weddings, funerals and other services leave church without feeling and looking wilted in hot weather, no drooping altar candles; (c) closed windows reduce cleaning bills and outdoor noises; (d) increased attendance due to greater year 'round comfort.

For more than 60 years Powers Control Systems have been providing thermal comfort in various types of buildings. Experience gained here and in many other prominent buildings should be helpful to you in selecting the most efficient control for your building.

For further information contact your nearest Powers office or write us direct.



THE POWERS REGULATOR CO.

SKOKIE, ILLINOIS | *Offices in Chief Cities in U.S.A., Canada and Mexico*

Over 60 Years of Temperature and Humidity Control

(e51)

PIN POINTED FOR SERVICE

Youngstown has 28 district sales offices conveniently located throughout the nation to serve you quickly. They are staffed with men who know the steel business thoroughly and are qualified to help you with your steel requirements. You can get quick service whether you write, wire or phone your nearby Youngstown District Sales Office.

QUALITY YOUNGSTOWN SERVICE

DISTRICT SALES OFFICES

Atlanta 1, Ga.
1310 Healey Building
Phone Walnut 5920

Boston 16, Mass.
250 Stuart Street
Phone Liberty 2-5855

Buffalo 2, N. Y.
1508 Liberty Bank Bldg.
Phone Washington 6270

Chicago 2, Illinois
111 W. Washington Street
Phone Franklin 2-5470

Cincinnati 2, Ohio
1302 Carew Tower
Phone Main 1424

Cleveland 13, Ohio
2400 Terminal Tower Bldg.
Phone Main 1-2605

Columbus 15, Ohio
2850 LeVeque Lincoln Tower
Phone Capitol 4-7211

Dallas 2, Texas
1602 First Nat'l. Bank Bldg.
Phone Riverside 9538

Denver 2, Colorado
814 Continental Oil Bldg.
Phone Main 3-2283

Des Moines 9, Iowa
437 Insurance Exchange Bldg.
Phone 3-1265

Detroit 2, Michigan
926 Fisher Bldg.
Phone Trinity 5-5816

Grand Rapids 2, Michigan
604 Michigan Nat'l. Bank Bldg.
Phone 9-4291

Houston 2, Texas
1350 Esperson Bldg.
Phone Fairfax 1325

Indianapolis 4, Indiana
520 Circle Tower
Phone Melrose 2-3461

Kansas City 6, Mo.
1222 Commerce Bldg.
Phone Victor 5837

Los Angeles 15, Calif.
714 W. Olympic Blvd.
Phone Prospect 7581

Milwaukee 3, Wisc.
2110 Wisconsin Tower
Phone Broadway 1-5148

Minneapolis 2, Minn.
1050 Baker Bldg.
Phone ATlantic 2970

New Orleans 12, La.
520 Whitney Bldg.
Phone Raymond 0153

New York 36, New York
500 Fifth Avenue
Phone Lackawanna 4-4340

Philadelphia 2, Pa.
1502 Girard Trust Bldg.
Phone Rittenhouse 6-9830

Pittsburgh 22, Pa.
Two Gateway Center
Phone Atlantic 1-2350

St. Louis 3, Mo.
611 Shell Bldg.
Phone Geneva 6-1223

San Francisco 5, Calif.
55 New Montgomery Street
Phone Garfield 1-6544

Seattle 4, Washington
457 Central Bldg.
Phone Main 6420

Tulsa 3, Oklahoma
1305 Philtower Bldg.
Phone 54-4634

Washington 5, D.C.
327 Bowen Building
Phone Republic 7-2340

Youngstown 1, Ohio
505 Stambaugh Building
Phone Riverside 7-0771

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

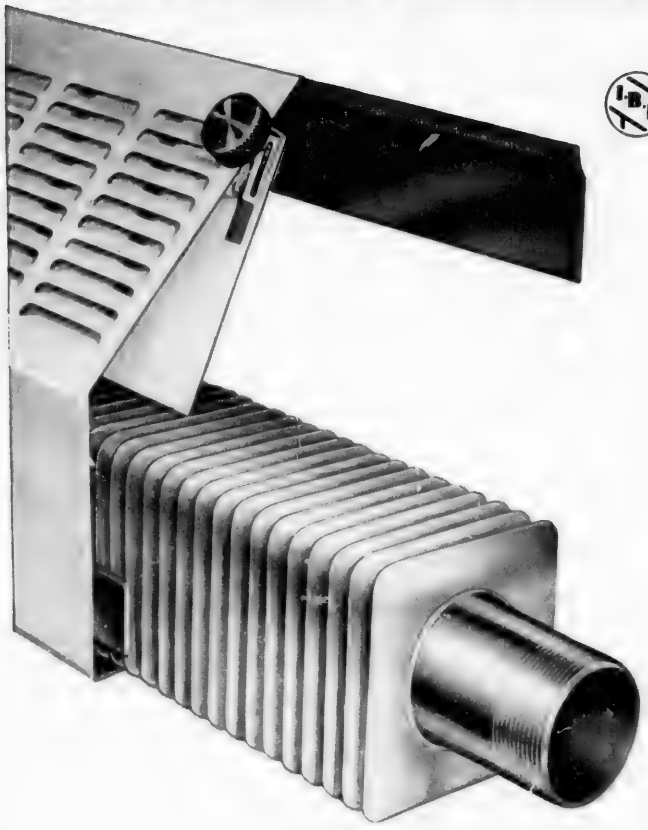
General Offices: Stambaugh Building - - Youngstown 1, Ohio
Plants: Youngstown, Ohio; Struthers, Ohio; Indiana Harbor, Indiana

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

SARCOfin

When you buy or specify radiation

make sure you get all these advantages!



Sarcofin offers you:

APPROVED RATINGS—as established by Institute of Boiler and Radiator Manufacturers for finned-tube and baseboard radiation.

FULL GUARANTEE—top-quality Sarcofin products, backed up by a *1-year guarantee* against defects in materials and workmanship. Heating elements *guaranteed* for maximum working pressures.

COOPERATION—careful selection of radiation by experienced Sarco and Sarcotherm heating engineers.

UNDIVIDED RESPONSIBILITY—the protection and convenience assured by obtaining from *one* "Complete Line" source...SARCO-SARCOTHERM... not only Sarcofin finned-tube and baseboard radiation but also heating specialties for steam and hot water, condensation and vacuum pumps, temperature regulators, and weather-compensated control systems for steam and hot water heating.

SARCO COMPANY, INC.
SARCOTHERM CONTROLS, INC.
Empire State Building, New York 1, N. Y.

MAIL COUPON FOR THESE BULLETINS

Sarco Company, Inc.—Sarcotherm Controls, Inc.
Empire State Building, New York 1, N. Y.

Please send me:
- ☐ 32 page Bulletin No. 1650 on Sarcofin Finned-Tube Radiation.
- ☐ Bulletin No. 1625 on Sarcofin Baseboard Radiation.
- ☐ Also information on_____

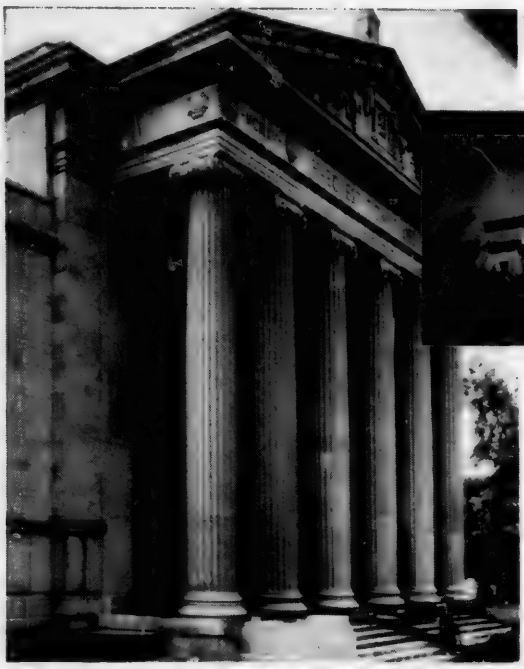
NAME_____

FIRM_____

ADDRESS_____

CITY_____ STATE_____

4005-B



St. Ann's Church
Cleveland Heights, Ohio

The Vivian Webb Chapel, Claremont, Cal.

St. John's Church, Delphos, Ohio

Installation, Church of St. Philip, The Apostle, Clifton, N.J.

Strassbourg Cathedral, 15th Century

BETTMANN ARCHIVE

COMFORT GOES TO CHURCH

Throughout the ages the nobility of man has found no higher expression than in the beauty of the world's churches, temples and cathedrals.

But the majesty of a fifteenth century cathedral, with its lofty spires and delicate filigrees of stone, is no more wondrous than its modern counterpart of perhaps lesser artistry but far greater *comfort* that encourages attendance at worship.

Yes, *comfort* goes to church, now . . . and so do millions more people.

One of the greatest advances in achieving church comfort has been the widespread adoption of radiant heating. For no heating is quite as effective as the gentle, all-permeating, sun-like warmth . . . without drafts, currents, or dead spots . . . achieved by modern radiant heating. Today's church designers know that radiant heating, which assures *utmost* comfort and health protection for both the very young and the elderly groups within congregations, is also ideally suited for every other age of worshippers.

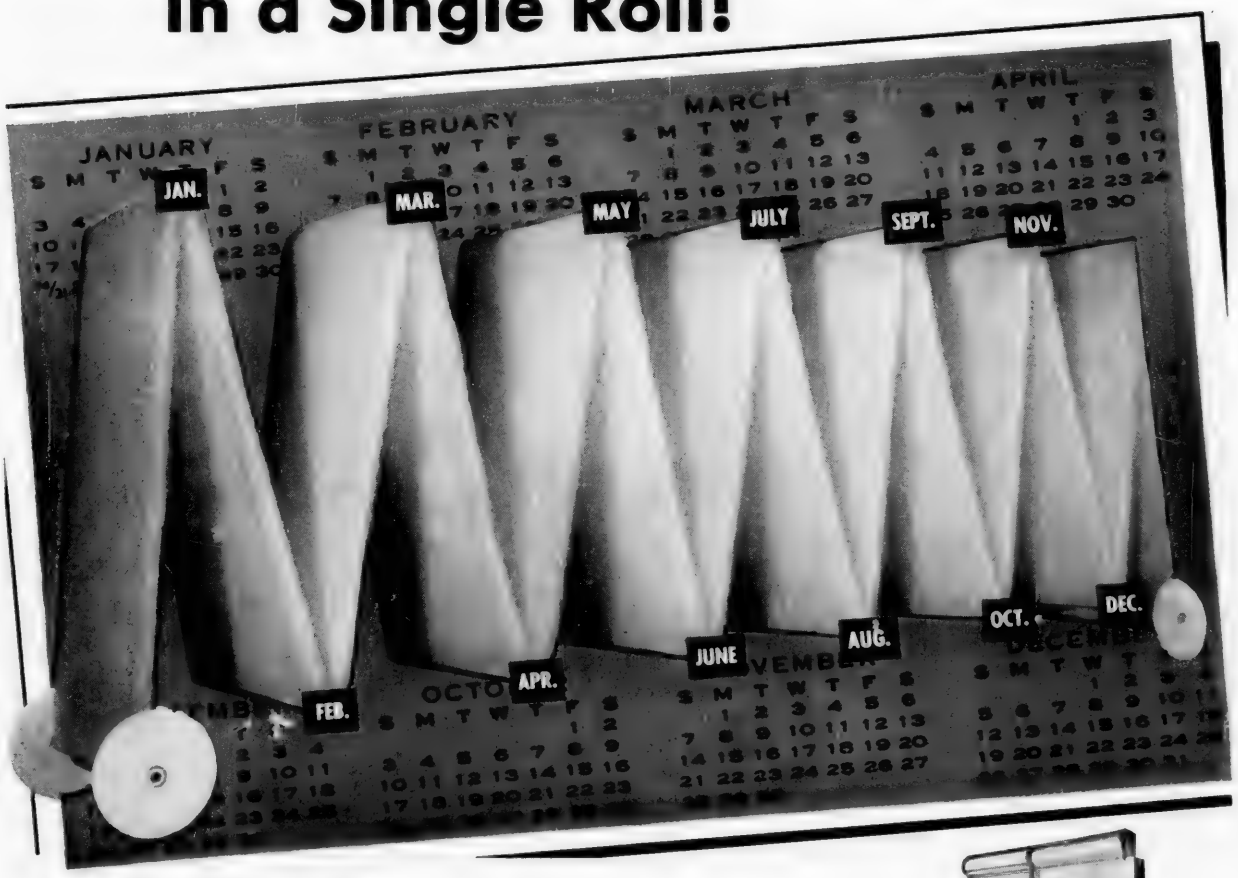
They know, too, that *steel pipe* is the most accepted medium for radiant heating systems . . . in fact, the most widely used pipe in the world for heating, plumbing, snow melting, fire sprinkler systems, and power, steam and air transmission.

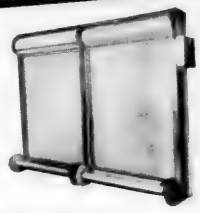
Send for your free copy of the 48 page color booklet "Radiant Panel Heating with Steel Pipe" and let comfort go to your church, too.

Steel Pipe is First Choice

Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 FIFTH AVENUE, NEW YORK 1, N. Y.

Year's Supply of Clean Air in a Single Roll!





Self-servicing ROLL-O-MATIC reduces filter maintenance to an annual event

It's just this simple. The above filter curtain, when installed in a ROLL-O-MATIC section up to 11 ft. high (18,000 cfm), represents a full year's supply of media under normal operating conditions.

Naturally, this is no ordinary filter curtain. It's a "blanket" of bonded glass fibers 5 ft. wide and 65 ft. long. But, presto—when wrapped on a spool it becomes a roll only 13" in diameter. Its cost—about half that of disposable filters of equal capacity.

Installation and operation of this media is much like that of a roll of film in a camera. Mounted at top of the ROLL-O-MATIC, it moves as a curtain down the face of the filter and is re-rolled at the bottom. Movement to maintain desired operating resistance is controlled by an automatic timer.

Is it practical? Scores of ROLL-O-MATICS are already in service rolling up new records for low cost, maintenance-free operation. Ask your local American Air Filter representative for ROLL-O-MATIC Bulletin No. 248.

AAF Dust Control Equipment

Illinois Steam Heating Specialties

AAF

American Air Filter

COMPANY, INC.

294 Central Avenue, Louisville 8, Kentucky

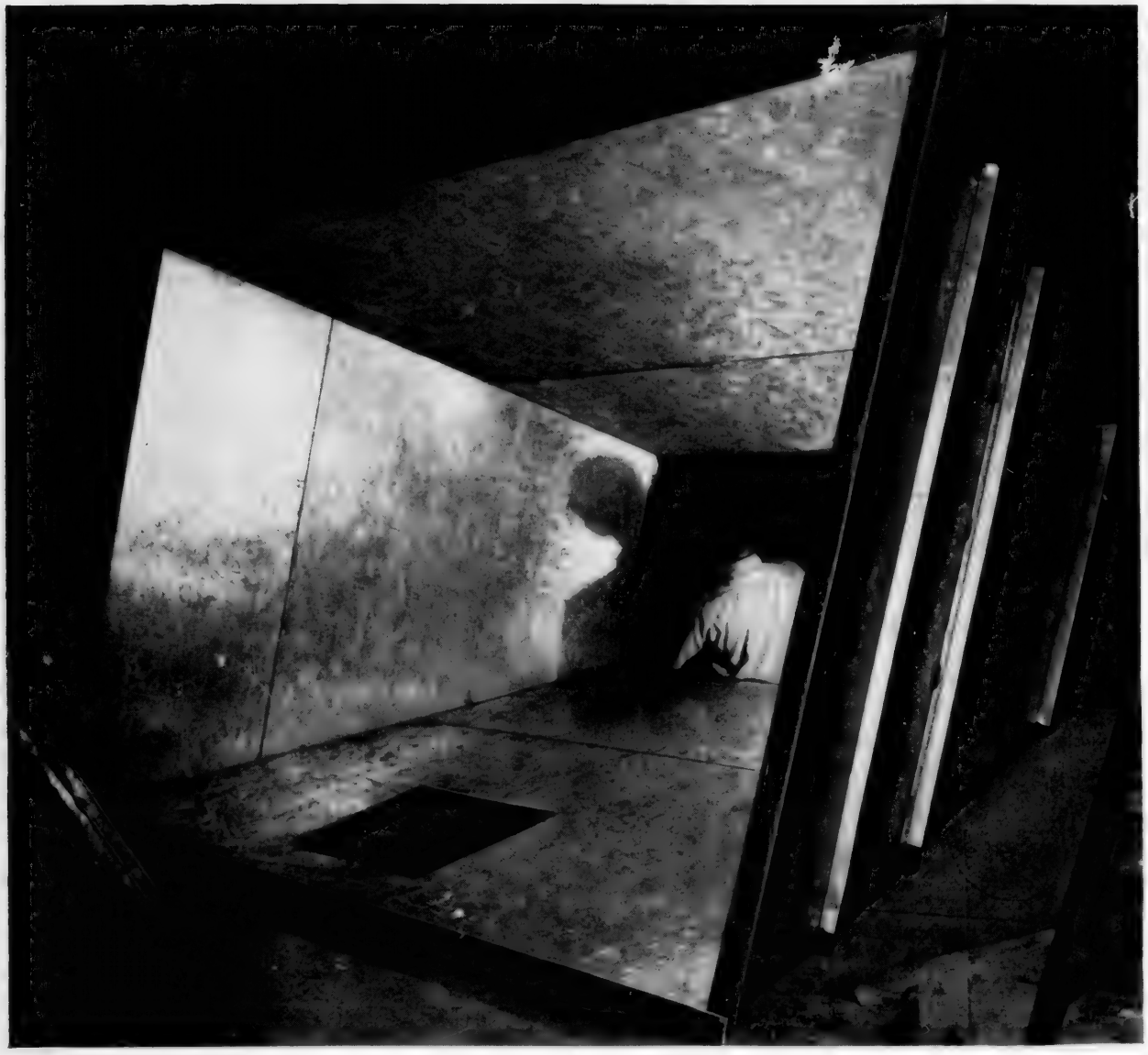
American Air Filter of Canada, Ltd., Montreal, P. Q.

Herman Nelson

BETTER AIR IS OUR BUSINESS

Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators



How Bethcon helps you do better sheet-metal work

Here we see part of the complex heating and ventilating system of a large department store in New Jersey. Tons of Bethcon galvanized sheets went into the fabrication of this system and contributed substantially to the quality of the installation.

You can do better sheet-metal work with Bethcon because Bethcon sheets are made by a continuous process of galvanizing, which binds the zinc coating more tightly to the steel than the conventional method. This extra-tight coating permits severe forming without danger of cracking or flaking off.

You will find, in addition, that Bethcon has brighter, more uniform spangles which present a more attractive appearance. And the zinc is distributed more uniformly over the entire sheet, thus eliminating the bead normally found on the drip end.

If you have not yet worked with Bethcon galvanized sheets a chat with someone who has should prove interesting to you. We will be glad to give you the name of such a contractor in your vicinity. And, of course, we are ready at any time to discuss Bethcon with you ourselves. Just call or write to the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

GILSULATE® helps Wisconsin School build 5 modern classrooms for less than $55,000

Cadott School

"The installation of this material is so simple that it is almost unbelievable."

E. F. Klingler & Assoc., Eau Claire, Wisc.

Considering that most modern schoolroom construction costs average well over $30,000 per classroom, the low cost of the Cadott School is outstanding.

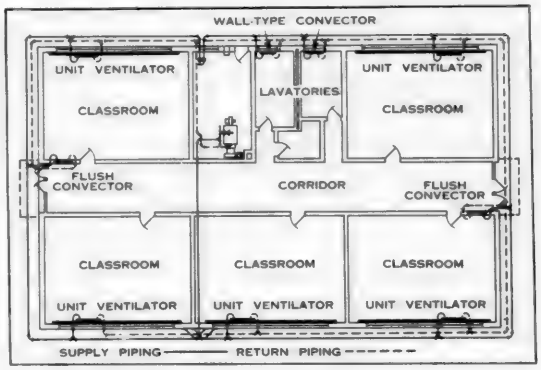
Several unique design features were incorporated in the building —among them, running steam and return mains about 6″ outside the foundation lines of the building, eliminating costly crawl space or pipe tunnel construction.

For pipe insulation, E. F. Klingler & Associates chose GILSULATE. The pipes were covered with GILSULATE to a thickness of four inches on all sides, and backfilled. At the highest point in the lines, there are six inches of fill over the insulation and at the low point, about two feet. GILSULATE is so effective that at no time during the winter did the snow melt above the pipes—or even thaw the earth.

No other method for insulating and protecting hot underground pipes can match Triple-Zone GILSULATE for low cost of installation, efficiency and permanence. Fill in coupon below for complete details.

FACTS ABOUT GILSULATE

1. **EASY TO USE**—just pour and tamp...pipe heat does the rest.
2. **FORMS 3 ZONES** of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. **NEEDS NO HOUSING OR MECHANICAL SHEATHS**: no mixing, special handling or equipment.
4. **ONLY NEEDS NORMAL PIPE SPACING**: for multiple pipe or cramped conditions.
5. **THREE TYPES AVAILABLE**:
   Type A for 200°-310° F. temp. range
   Type B for 300°-385° F. temp. range
   Type C for 385°-520° F. temp. range



Cadott School floor plan

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

American Gilsonite Co.
134-A West Broadway, Salt Lake City 1, Utah — or — 1145 East Jersey St., Elizabeth, N. J.

Send me more information on GILSULATE Insulation

NAME .....

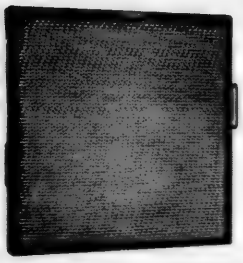
TITLE .....

COMPANY .....

ADDRESS .....

AHV

HERE'S THE SEQUEL TO "...or equal"



Standard 2" FAR-AIR Panel Filter.

Send for your copy showing complete specifications on the FAR-AIR line of quality filters.

When you see this specification..."FAR-AIR® filters or equal" remember that these filters *have no equal*. Substitutes mean contributions to the junk pile and higher eventual costs, so it pays to install the finest—FAR-AIR.

In FAR-AIR you get filters that handle more air with greater efficiency. Because of their greater dirt-holding capacity, you save up to 60% in maintenance. The "lifetime engineering" of FAR-AIR filters with their heavier frames, reinforcing rods and other features, insures that each unit will continue to operate with replacements virtually eliminated.

Yes, you'll want to use FAR-AIR filters eventually, so why not install them initially. Write for complete catalog information to FARR COMPANY, P.O. Box 45187, Airport Station, Los Angeles 45, California.

ORIGINATORS OF FAR-AIR CERTIFIED FILTER SERVICE

FARR COMPANY

NO COMPROMISE ON QUALITY

Los Angeles, New York, Chicago
New Orleans

MANUFACTURED UNDER LICENSE BY FARR COMPANY MANUFACTURING LTD. MONTREAL, CANADA

NOW profil comes in colors

DUSTY PINK · FRENCH GRAY · FIRNMIST · COLONY BLUE · SANDALWOOD · POTTERY BLUE

as shown in illustration

a completely **NEW** sales appeal in

Curtis AIR CONDITIONING UNITS

It's a Curtis exclusive!

For the first time Curtis packaged air conditioning units in a rainbow of cool restful colors baked on at the factory. Dealers everywhere will welcome this sales plus because:

1. The modern trend is to colors in appliances of all kinds. Now you have it in Curtis packaged air-conditioning.

2. Combinations of colors are available to complement any decorative pattern your customer may desire!

3. A whole new field is opened to you with these new colorful Curtis units that cool and add beauty to any interior.

and ONLY Curtis has it!

Remember, you can count on Curtis

MANUFACTURING COMPANY
Refrigeration Division

1999 KIENLEN AVE. • ST. LOUIS 20, MO.

CURTIS PACKAGED AIR CONDITIONING UNITS—SPECIFICATIONS

CABINET

Constructed of heavy gauge steel with an attractive baked finish that can be furnished in various color combinations as selected by customer.

HUMIDITY CONTROL

All units are furnished with a by-pass damper.

INSULATION

The interior is entirely insulated with approved type of heavy insulating and sound-absorbing material. This prevents exterior sweating and insures quietness.

COMPRESSOR—COMPRESSOR MOTOR

Hermetic and semi-hermetic type for F-22.

CONDENSER—RECEIVER

Shell and coil type with Lo-Fin copper tubes. Extra large capacity, low pressure drop, for either city water or cooling tower. A.S.M.E. condenser (with liquid level gauge assembly connections) standard. A fusible safety union standard on all models.

MAGNETIC MOTOR STARTER

Across-the-line magnetic motor starter provided with thermal overload protection.

FILTERS

Standard throw-a-way type.

COOLING COIL

Properly sized, balanced with the condensing unit. Copper tube and aluminum fin construction, mechanically and thermally bonded for highest heat transfer. Tubes are staggered and headered for maximum efficiency.

CONTROL

An automatic thermostat and a three position selector switch is built into the unit and is adjustable from the exterior of the cabinet. The fan may be operated separately for ventilation when cooling is not required. High pressure cutout-control is regular equipment. (Cutout pressure for F-22 is 350 PSI.) Note: On Model Series 15 & 20, selector switch controls No. 1 compressor; thermostat controls No. 2 compressor.

OPTIONAL EQUIPMENT

The following is available when specified.

PLENUM AND GRILLE ASSEMBLY

When duct work is not necessary the plenum and grille assembly is available as an extra. The discharge grille is adjustable in two directions.

WATER REGULATING VALVE

For use with city water supply. Valve is not attached.

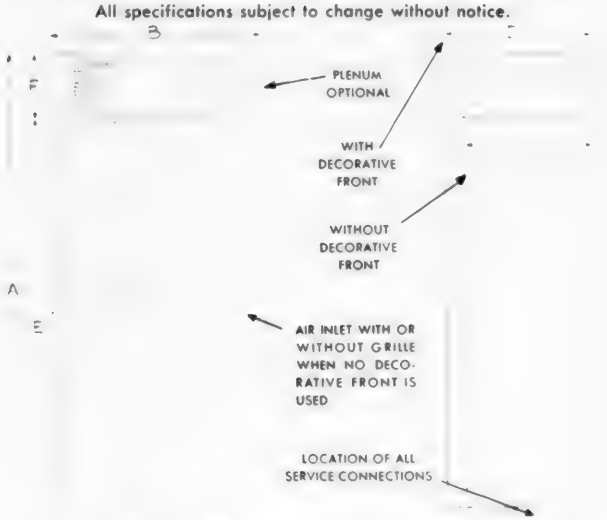
HEATING COIL

When specified, one or two row heating coil, hot water, steam, or steam distributing tube type can be provided for field installation.

COOLING COIL

For special applications, additional rows can be furnished, when heating coil is not used.

All specifications subject to change without notice.



FRONT VIEW — SIDE VIEW

MODEL	COMPRESSOR	C.F.M.	NO. OF BLOWERS	DIMENSIONS A	B	C	D	E	F
CA1200	1-0 HP	4000	2	98¾	54	24	27½	80	33¾
CA1600	2-7½ HP	6000	3	98¾	78	25	28½	80	33¾
CA2200	2-10 HP	8000	3	98¾	78	25	28½	80	33¾

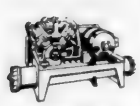
Standard air discharge is vertical up on all units; only on model CA2200 top horizontal air discharge (front or rear) optional with standard parts.

SEE YOUR CURTIS REPRESENTATIVE

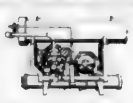
OR

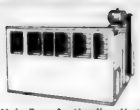
WRITE

Curtis


Condensing Units Up to 100 Tons

Cooling Towers Up to 100 Tons

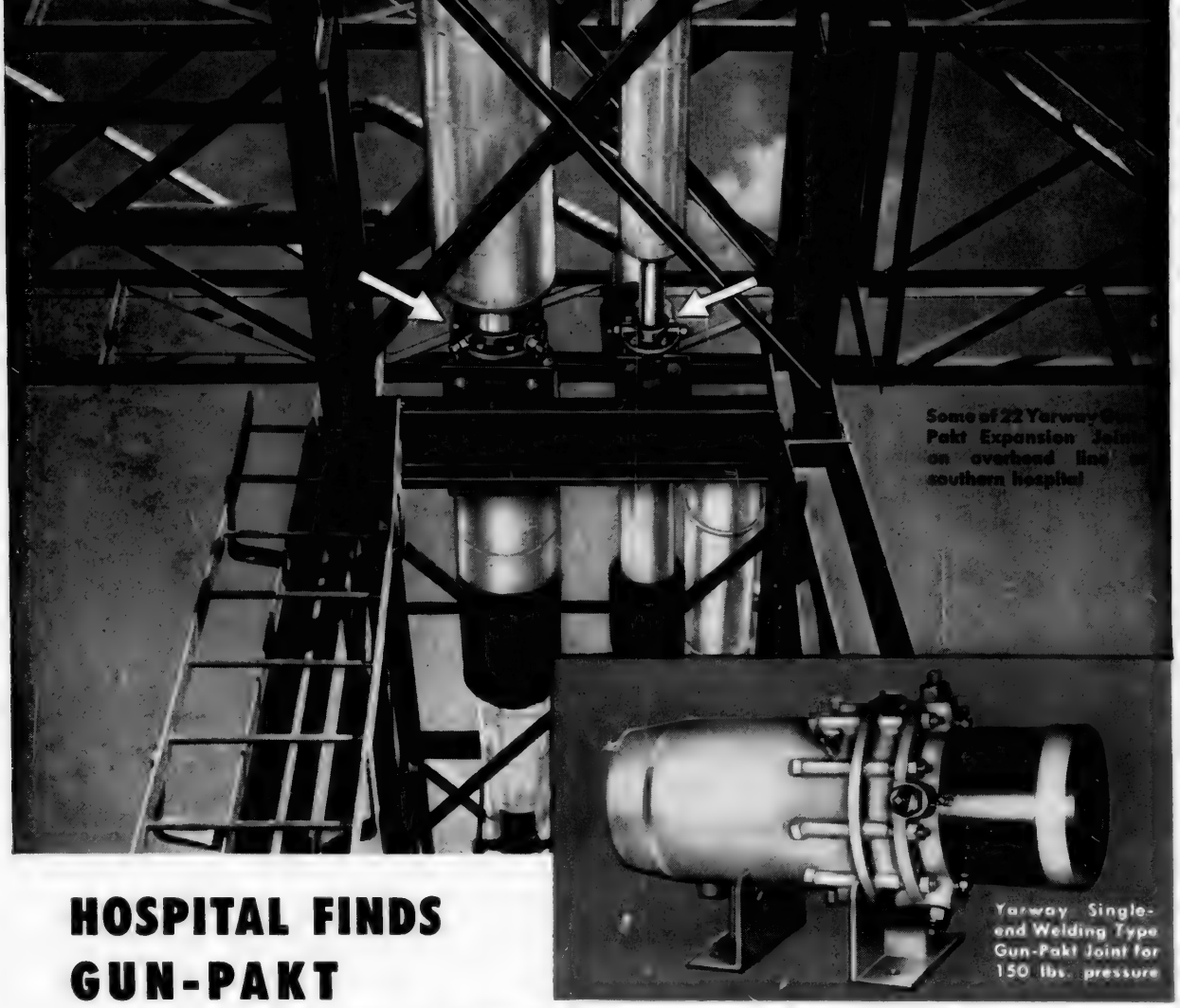

Packaged Liquid Chillers Up to 100 Tons


Multi-Zone Air Handling Units Up to 75 Tons

Condensing Units Air Cooled Commercial Residential

102 YEARS OF MANUFACTURING EXPERIENCE

MANUFACTURING CO.
Refrigeration Division
1999 Kienlen Ave. • St. Louis 20, Mo.


Some of 22 Yarway Gun-Pakt Expansion Joints on overhead line at southern hospital
Yarway Single-end Welding Type Gun-Pakt Joint for 150 lbs. pressure

HOSPITAL FINDS GUN-PAKT *SURE CURE FOR EXPANSION JOINT TROUBLES*

YARWAY Gun-Pakt Expansion Joints are just what the "doctor" ordered for this overhead steam line at a large southern hospital—and he ordered 22 of them!

In institutions, industrial plants and other large steam distributor systems YARWAY Gun-Pakt Joints are growing in popularity.

YARWAY Gun-Pakt slip-type joints give long life—no fatigue failures.

You need *fewer joints per length of line*, with traverses up to 12" single and 24" double.

With Gun-Pakt joints packing may be added as necessary, *under full steam pressure right on the job—no unpacking, no shutdowns.*

There's also *lower pressure load on end anchors* because excessive strains are eliminated.

All these are reasons why it will pay you to "do as the doctor ordered"—look into YARWAY Gun-Pakt Expansion Joints. Write for Bulletin EJ-1914.

YARNALL-WARING COMPANY
104 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities

YARWAY

GUN-PAKT EXPANSION JOINTS

104 Mermaid Avenue, Philadelphia 18, Pa.

How to Select an Economical Temperature Regulator

First of all, what does *economy* mean where temperature regulators are concerned? In some industries it means improvement of product or reduction of spoilage through closer control of process temperatures. In others, it means the paring down of operating expense. The price of the regulator itself is a relatively small factor.

Today's buyers are shopping for:

1. Accuracy of control — not only when the regulator is new, but throughout its service life
2. Dependability — to prevent loss of production time
3. Minimum installation and maintenance cost

Here are a few tips on what to look for when you're installing a new or replacing an old temperature regulator —

Packless construction . . . and for this reason: A diaphragm operated, packless regulator minimizes friction. There are no closely fitted parts to stick or bind because of uneven expansion or collection of foreign matter. Also, there's less maintenance, since no repacking is ever required.

A guarantee against wire drawing of the seats and discs. Insist on it. This guarantee in combination with single seat design assures you of tight shutoff; you avoid expensive steam losses as well as loss of product in a process application.

Broad control range. In a standard regulator you should expect a control range of 100 F. And make sure the unit you select has a vapor tension thermostat that can take over-temperatures of at least 100 F.

Easy maintenance. Why ask for grief? Your temperature regulator should be basically simple in design so that it can be serviced by average plant personnel. All parts should be readily accessible for testing and cleaning.

Double duty. There's no point in buying a separate pressure regulator when you can select a temperature regulator that combines both temperature and pressure control within the same unit.

Self-operating. Make sure you get a regulator that operates on its own initial pressure. By doing so, you avoid the purchasing and maintenance of an air compressor plus air piping, and you're sure of uninterrupted operation during electric power failures.

• • • •

All of these points are important to you when it comes to selecting an economical temperature regulator. Perhaps you didn't realize you *could* expect so much. And perhaps you didn't realize that Spence Temperature Regulators offer all these features and more. May we send you our Bulletin T500 containing further details? SE 135

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

NEW HI-VALVE Aircoustat

Quiets ALL Noise in High Velocity Systems

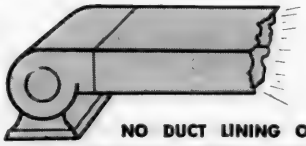
COMBINES QUIET PRESSURE REDUCING VALVE WITH REVOLUTIONARY AIRCOUSTAT SILENCER IN ONE ENGINEERED PACKAGE

Here at last is the practical, economical solution to the three noise problems which have plagued consulting engineers and contractors on all high velocity air conditioning systems: fan noise, valve noise and duct noise.

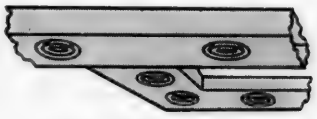
Specially designed and acoustically engineered to provide *complete* noise attenuation, Hi-Valve Aircoustat combines a silent flow pressure reducing valve with the jet engine type Aircoustat silencer which has revolutionized the air conditioning field.

Easily installed in branch ductwork ahead of the diffusers, Hi-Valve Aircoustat eliminates the need for expensive duct line mufflers and high velocity diffuser units . . . effecting substantial savings in space and on equipment and installation costs.

Write for complete information on Hi-Valve Aircoustat . . . the space-saving "all-in-one" unit which is engineered to take the guesswork out of High Velocity System silencing.



NO DUCT LINING OR HIGH VELOCITY DIFFUSER UNITS

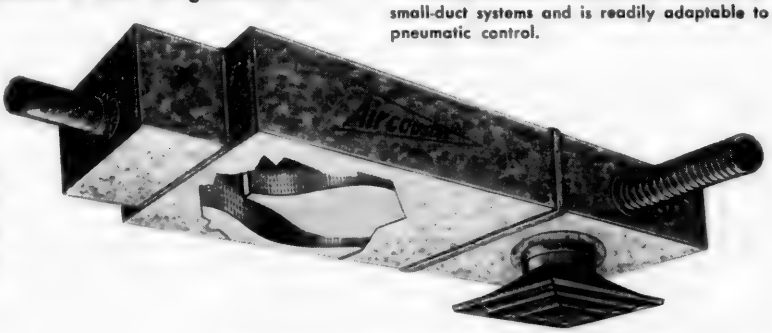


HANDLES UP TO 3,000 CFM

Hi-Valve Aircoustats are installed directly in the ductwork, eliminating the need for duct lining and high velocity diffuser units. Because of the high capacity, a single unit can handle silencing and pressure reduction for up to 3,000 C.F.M. and is adaptable to split systems as well as single diffuser operation.

Use of easy-to-install Hi-Valve Aircoustat eliminates hit-or-miss silencing . . . assures complete attenuation and accurate pressure control.

Versatile Hi-Valve Aircoustat is available for small-duct systems and is readily adaptable to pneumatic control.



Quiets All 3 Noises with a Single Unit
Hi-Valve Aircoustat provides acoustically engineered, single-unit silencing of *all* high velocity system noises: fan noise, valve noise and duct noise.

Mail this coupon TODAY ▶▶▶

INDUSTRIAL SOUND CONTROL, INC.
45 Granby St., Hartford 12, Conn.
Please send me more information on Hi-Valve Aircoustat.

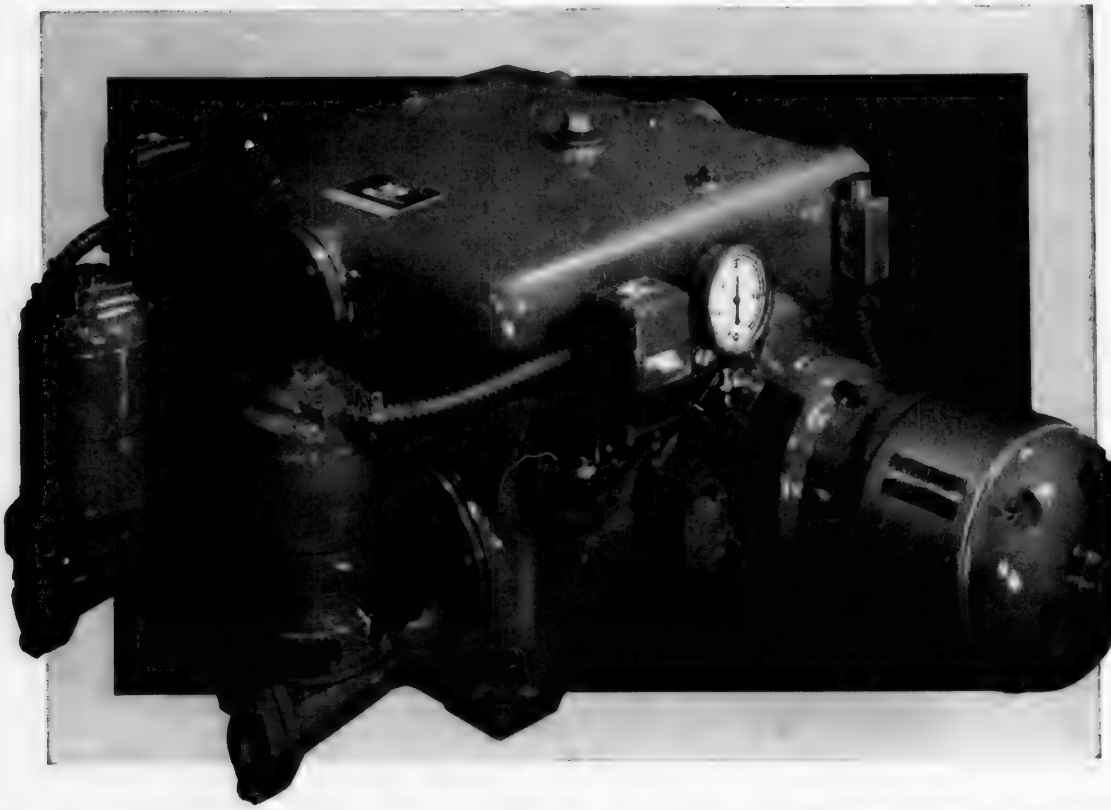
NAME .....
TITLE .....
COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY

437 WILSON, SO. NORWALK, CONN.

Pointers on the selection of

Fractional Horsepower Motors

T. E. M. CARVILLE and L. W. BUCHANAN

Small Motor Division, Westinghouse Electric Corp.

Although there are many types of fractional horsepower motors that can be used for heating and ventilating applications, intelligent selection of the one most suitable to match load characteristics will result in greater operating economy and perhaps lower initial cost. Each type motor is described. An application table plus data clarify the kind of service for which each class motor is best suited.

MANY different types of fractional horsepower motors are used for heating and ventilating applications. When properly applied, each of these motors is selected for its specific duty by carefully matching its inherent operating characteristics to the characteristics of the load. To do this, the heating and ventilating engineer should be thoroughly familiar with the various kinds of motors, their performance characteristics, their limitations, and certain other factors, such as method of protection against overload.

General

It is generally known that if one lead of a three-phase (polyphase) motor is disconnected from the line while the motor is running, it will continue to operate on the phase that remains connected providing the connected load is not too great. However, the speed will be reduced. In this case rotation is maintained by the pulsating field produced by the single phase that is connected to the line and by the field set up by the rotating rotor. A polyphase motor at rest will not start if only two of its leads are connected to the line since the single-phase pulsating field does not rotate and hence is unable to initiate rotation of the rotor.

A single-phase induction motor, then, must have some auxiliary means of providing a rotating field for starting. The common method of providing this in single-phase induction motors is to add an auxiliary (starting) winding displaced from the main winding in both time and space. This second winding is generally separated in space by 90 electrical degrees from the main winding. Rotation is produced by creating an electrical phase displacement between the currents in the two windings. If the starting winding remained in the circuit under normal load conditions, losses would be excessive, the motor would overheat, and the starting winding would burn out. For this reason the starting winding is disconnected at approximately 75% of the motor's rated speed. This means that some disconnecting means also must be provided in each motor.

Types of Motors

Split-Phase. The split-phase motor is a single-phase induction motor having an auxiliary starting winding that has a high ratio of resistance to reactance as compared to the main winding connected in parallel with it. See Table 1. In this type of motor, the auxiliary or starting winding is disconnected either by a centrifugally-operated starting switch or by a relay when the motor reaches about three quarters of rated speed. These motors have from low to medium starting torque depending on their rating. For ratings above 1/6 hp the locked-rotor or starting torque is kept low because of locked-rotor current limitations, which will be discussed later. Split-phase motors have a relatively low cost and are simple in construction compared with most other single-phase motors of the same ratings.

Some split-phase motors, for use on infrequently-started devices, are provided with higher starting torques that can be obtained with the normal starting currents for this type of motor. In these cases the starting current is above the NEMA value for single-phase fractional horsepower motors as shown in Table 2.

There are various methods of obtaining two-speed operation of split-phase motors. One common means is shown in Table 1.

When the split-phase motor drives through a belt, it is frequently provided with built-in thermal protection

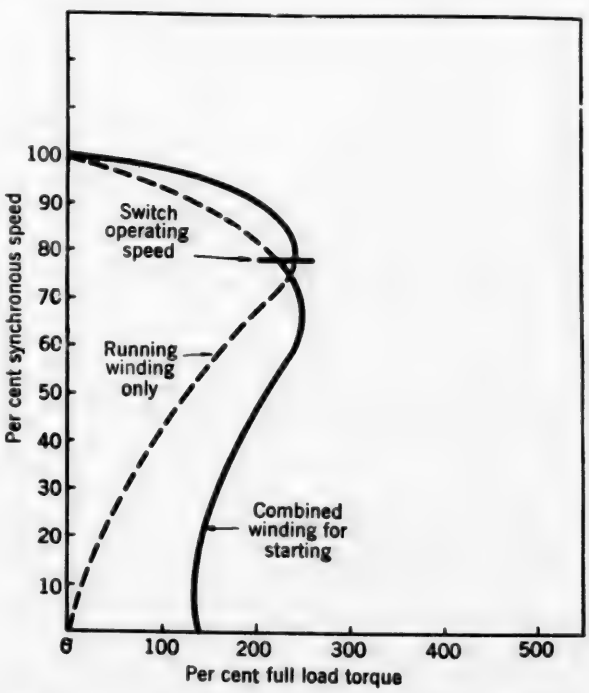


Fig. 1—Speed-torque curve for a normal-purpose split-phase motor.

TABLE 1. FRACTIONAL HORSEPOWER MOTORS—APPLICATION DATA

Type of Motor				Wiring Diagram	HP Range	Speed Data			Approximate Torque (4-Pole Motors)		Built-in Starting Mechanism	Application Data
						Rated Speed	Speed Characteristics	Speed Control	Starting	Breakdown		
Alternating Current	Single Phase	Split Phase	Normal Purpose Low Locked rotor amperes		1/20 to 1/3	1725 1140 860	Constant	None	Medium to low	Medium	Centrifugal switch	For oil burners, fans, blowers, low locked-rotor current minimizes light flicker making motor suitable for frequent starting. For applications up to 1/3 hp where medium starting and breakdown torques are sufficient.
			High Starting Current		1/4 and 1/3	1725	Constant	None	Medium	High	Centrifugal switch	Ideal for sump pumps. For continuous and intermittent duty where operation is infrequent and locked-rotor current in excess of NEMA values is not objectionable. May cause light flicker on underwired or overloaded lighting circuits.
			Two-speed (Two windings)		1/8 to 1/4	1725/1140 1725/860	Two-speed	1-Pole, double-throw switch	Medium	Medium	Centrifugal switch	For belted furnace blowers, attic ventilating fans, similar belted medium-torque jobs. Simplicity permits operation with any 1-pole, double-throw switch or relay. Starts well on either speed—thus used with thermostatic or other automatic control. Tight belt or incorrect pulley ratio may overload motor.
		Capacitor	General Purpose Capacitor-start		1/6 to 3/4	1725 1140 860	Constant	None	High	High	Centrifugal switch	Ideal for all heavy-duty drives, such as compressors, pumps, stokers, refrigerators, air conditioning. All purpose motor for high starting torque, low starting current. Quiet, economical. High efficiency and power factor. Single voltage in 1/6, 1/4 hp, 1725 rpm ratings—dual voltage in others.
			Two-speed Capacitor-start (Two windings)		1/6 to 3/4	1725/1140 1725/860	Two-speed	1-Pole, double-throw switch	Medium	Medium	Centrifugal switch	Supplements line of 2-speed split-phase motors. Used on identical applications requiring horsepower ratings from 1/3 to 3/4 hp.
			Permanent Split (Single value)		1/20 to 3/4	1625 1075 825	Constant or adjustable varying	Two-speed switch or autotransformer	Very low	Low	None	For direct connected fan drives, particularly unit heaters. Not for belt drives. Same motor adaptable for 115 or 230 volts for 1-speed, 2-speed, or multi-speed service by use of 1-pole, single-throw switch, 2-pole, double-throw switch, or speed controller, respectively. Fan load must be accurately matched to motor output for proper speed control. All ratings dual voltage and dual rotation.
		Shaded Pole	Shaded Pole		1/300 to 1/6	1550 1050 800	Constant or adjustable varying	Choke coil	Very low	Low	None	Constant speed, switchless motor for low-power applications. Used for fans, small blowers, unit heaters. With fan load accurately matched to motor output, proper speed control can be obtained by means of series choke or resistance.
	Polyphase	2 or 3 Phase	Squirrel Cage		1/4 to 3/4	1725 1140 860	Constant	None	High to medium	Extra high	None	For all applications where polyphase circuits are available.
Direct Current			Shunt Wound and Compound Wound		1/20 to 3/4	1725 1140 860	Constant or adjustable varying	Armature resistance	Extra high	—	None	For all applications operated from d-c circuits. Companion d-c motor to single phase and polyphase a-c motors. Ratings of 1/12 hp, 1725 rpm and smaller shunt-wound. Larger ratings compound wound. Starting rheostats recommended for ratings 1/2 hp and up.
			Series Wound		1/125 to 1/30	900 to 2000	Varying or adjustable varying	Resistance	Extra high	—	None	Companion d-c motor to shaded pole motor for fan applications. Used instead of shunt motors in smaller ratings to avoid having very fine wire in field windings.

T. E. M. Carville holds B.S. and E.E. degrees from the University of Maine. Following graduation, he joined the Graduate Student Course at Westinghouse in 1924. He was a design engineer, Small Motor Division from 1925 to 1941, both at Springfield, Mass., and Lima, Ohio. For the next three years he was Section Supervisor, Small Motor Engineering Department, and from 1944 to 1955, Manager of Industrial Engineering Department, Small Motor Division. Since June, 1955, he has been assistant to manager, Industrial Motor Department, Small Motor Division. He is a registered engineer, State of Ohio, fellow of AIEE, member of Ohio Society of Professional Engineers and National Society of Professional Engineers.

L. W. Buchanan received his B.S. in E.E. from Purdue University in 1937 and his M.S. from the University of Pittsburgh in 1953. He joined the Westinghouse Electric Corp. as design engineer in the Small Motor Division. After four years, he served as an officer in the U. S. Army Signal Corps from 1941 to 1945. He returned to Westinghouse in the Induction Motor Section, Small Motor Division, where he has been design engineer and section manager from 1945 to date. He is a registered engineer, State of Ohio; member of AIEE and the Ohio Society of Professional Engineers. Beside papers, that he has presented before AIEE meetings, he has written a number of articles published in technical magazines.

to prevent damage from overloading due to a tight belt or incorrect pulley ratio.

Capacitor. The capacitor motor, a modification of the split-phase type, is an induction motor whose auxiliary winding is connected in series with a capacitor. In fractional horsepower ratings, it is generally built in two types—the capacitor-start type and the permanent-split capacitor type.

The principles of operation and the construction of the capacitor-start motor are similar to the split-phase motor except for the addition of the electrolytic capacitor. The capacitor-start fractional horsepower motor is manufactured in ratings of from 1/6 to ¾ hp. It is a general-purpose motor suitable for most applications.

For ratings of 1/3 hp and above, many capacitor-start motors are manufactured for dual-voltage operation. In the case of a 115/230-volt capacitor-start motor, the main winding is made in two sections. The sections are connected in parallel for 115-volt operation and in series for 230-volt operation The auxiliary winding and the capacitor connect across one section of the main winding. Wiring connections for operation at the desired voltage can be made at the motor terminal board following instructions supplied by the motor manufacturer.

The permanent-split capacitor motor uses a continuous-duty oil-filled capacitor during both the starting and running periods. This type of motor has low starting current and torque. With both the main and auxiliary windings in the circuit at all times, it is possible to obtain speed control on this type of motor when the load is accurately matched to the motor characteristics. No centrifugal starting switch or relay is used. The speed control is obtained by impressing different voltages on the windings by such means as an autotransformer.

Shaded-Pole. Another type of single-phase motor is the shaded-pole motor. The starting torque of a shaded-pole motor is provided by an auxiliary, permanently short-circuited winding or windings placed around a portion of the main pole. This winding is frequently a copper strap wrapped around a portion of the pole. The flux through the shaded section of the pole lags behind the flux in the rest of the pole, thus producing the effect of a rotating field and providing a starting force. The starting current and torque of this type motor are very low compared with other types of single-phase motors. The shaded-pole motor is rugged and simple in construction. Its low efficiency, due to losses produced by the shading coil, has limited its application to the smaller ratings.

Repulsion-Start. Although repulsion-start induction motors are in use, in the fractional horsepower sizes they have been supplanted by the capacitor-start motor in many cases. The repulsion-start induction motor starts on the repulsion principle. Single-phase power is applied to the stator winding. This induces current flow in the rotor winding, which is similar to that of a d-c commutator motor. The brush axis is displaced several degrees from the line of flux flow. This permits an unbalanced current flow in the two halves of the rotor and the resultant torque starts the motor. As it approaches full speed, the armature coils are short circuited by a centrifugal mechanism, and the motor then operates on the induction principle with the same characteristics as a split-phase or capacitor-start motor. In some motors the brushes are lifted when the armature windings are short circuited in order to reduce brush wear and noise. The advantage of the repulsion-start induction motor is extra high starting torque with low starting current. It has the disadvantages of a wound armature, brushes, armature short-circuiting mechanism, brush-lifting mechanism and their attendant maintenance.

Polyphase. The polyphase fractional horsepower motor is similar to its integral horsepower counterpart except that it is generally built with the components designed for split-phase or capacitor-start motors due to its relatively low activity. The starting torque of the polyphase induction motor is from medium to high. It is suitable for all constant speed applications where polyphase power is available. It has the advantage of simplicity and very low maintenance. However, in many cases single-phase motors of fractional horsepower ratings are used even though polyphase power is available because the single-phase control is simpler.

Direct-Current. For direct-current use there are shunt-, compound-, and series-wound direct-current motors. The activity on these is low but they can be used in place of the single-phase or polyphase motors where d-c power is available.

Starting Torque

The starting torque in fractional horsepower induction motors is proportional to several factors, including the product of the current in the two windings and the size of the angle between these currents.

In a typical split-phase motor, the current (at starting) in the main winding usually leads the current in the auxiliary winding by 20 to 30 degrees. This creates the needed revolving magnetic field during starting. The

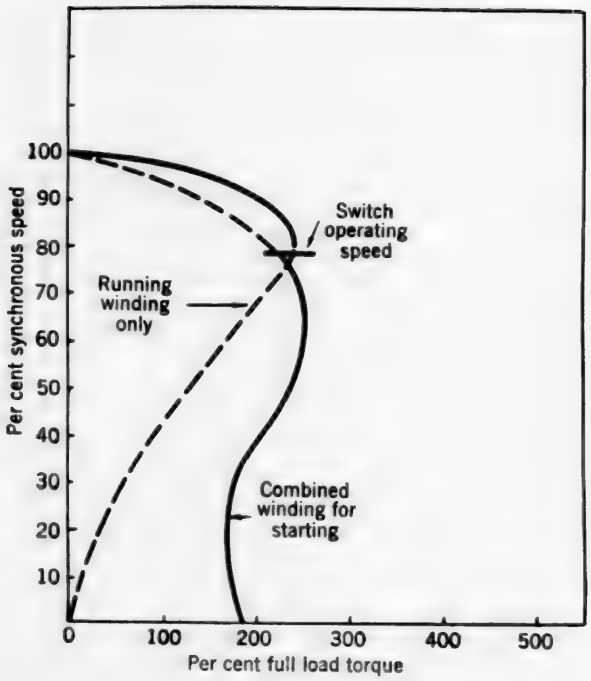


Fig. 2—Speed-torque curve for a split-phase motor having high starting current.

starting torque of a normal purpose split-phase motor is low, about 140% of full load torque.

In the case of a capacitor-start motor of the same rating, the current (at starting) in the auxiliary winding leads the current in the main winding by 75 to 85 degrees. Because of this, the starting torque of these motors is comparatively high—about 275 to 375% of full load torque. From this it is evident that a capacitor-start motor can be expected to produce from two or three times as much starting torque per ampere as can a split-phase motor.

Since the capacitor-start motor is more expensive, the question might be raised as to why we should not increase the starting current of the split-phase motor to obtain the required starting torque. For example, if we require 25 oz-ft of starting torque, why not obtain it from a split-phase motor with about 40 amperes starting current instead of from a capacitor-start motor with about 15 amperes starting current? One reason is that excessive starting currents on frequent-starting applications may result in objectionable light flicker. In order to avoid this, many utilities restrict the use of single-phase motors with high starting currents. The general rules are:

(1) Automatically controlled single-phase motors for general use cannot draw starting currents greater than 20 amperes (plus 15% tolerance) at 115 volts, or more than 25 amperes (plus 15% tolerance) at 230 volts.

(2) Manually controlled single-phase motors for general use cannot draw starting currents greater than 40 amperes (plus 15% tolerance) at 115 volts, or more than 50 amperes (plus 15%) at 230 volts.

(3) Motors that draw starting currents greater than these values can be used if approved by the utility.

Table 2 gives NEMA maximum locked-rotor currents for fractional horsepower motors of different ratings.

Figures 1 through 8 show speed-torque curves for various fractional horsepower motors. Suggested type of application for which each is best suited is summarized in Table 5.

Applying Fractional Horsepower Motors

Nameplate Data. When selecting motors for an application, the motor must first be matched to the power supply. Each motor has a nameplate attached to it. This nameplate ordinarily gives the name of the manufacturer, the rating in horsepower and speed, the temperature rise and duty cycle, power-supply frequency and voltage, full-load amperes, service factor, locked KVA code number, and manufacturer's identification number.

If the motor nameplate is not accessible, the information regarding power supply should be available at the point the apparatus is connected to the line. Power supply information includes voltage, frequency, and full-load amperes. A motor should be connected only to a power source that matches its rating.

Motors in agreement with NEMA standards can be operated successfully at rated load with a variation of plus or minus 10% in voltage or plus or minus 5% in rated frequency, or a combined variation of 10%. However, this operation is not necessarily in accordance with standards established for operation at rated voltage and frequency.

The nameplate amperes is that current required to operate the motor under normal load. This current must be used in many instances to determine the proper size of supply circuit and protector according to the National Electrical Code or local code for wiring. The locked KVA per horsepower is also used in determining the circuit protection according to Table 20 of the National Electrical Code (Not published with article).

Loading. Motors are designed to give long and trouble-free service when operated under conditions indicated on the nameplate. This means that the average load should be near the rated load. In general, the most obvious means of checking the load on the motor is by comparing the amperes taken by the motor to that shown on the nameplate. Although this is not the best method of

TABLE 2. NEMA MAXIMUM LOCKED-ROTOR CURRENTS OF 60-CYCLE SINGLE-PHASE FRACTIONAL HORSEPOWER MOTORS*, 900 to 3600 RPM INCLUSIVE

Horsepower	115 Volts	230 Volts
1/6 and smaller	20	10
1/4	23	11 1/2
1/3	31	15 1/2
1/2	45	22 1/2
3/4	61	30 1/2

*Except the split-phase motors uesd on laundry equipment.

TABLE 3. TERMINOLOGY OF LOCKED-ROTOR TORQUE CLASSIFICATIONS

Term	Locked-rotor Torque (% of Full-load Torque)
Very low	Below 85
Low	85 to 160
Medium	160 to 275
High	275 to 375
Extra high	Above 375

checking load and cannot be relied on entirely, it is usually the one most available and for that reason it is quite often used. Particularly with regard to single-phase motors, the full-load amperes may be only 40 to 50% greater than the no-load amperes and in some motors may actually be no greater. Furthermore, variations in applied voltage and in motor construction will have considerable effect on the full-load amperes for single-phase motors.

If it is necessary to calibrate accurately the load on a motor, a much better criterion is to determine the watts taken by the motor. The watts supplied to the motor when driving the required load together with the voltage at which the test is run, with any duty cycle variations, should be submitted to the manufacturer with the nameplate identification of the motor. With this information the manufacturer can usually give the actual load which the motor is driving. In connection with this, it is usually helpful to submit also the watts input with motor running without load—this permits the manufacturer to estimate the load more accurately. The variation in wattmeter reading between no load and full load normally is from 300 to 700% depending on size of motor.

When applying motors by means of matching the full-load amperes, it must be remembered that a 15% change in current may mean a 25 to 35% change in load; and when one loads a motor to 115% of its full-load amperes, the motor may be considerably overloaded.

Temperature and Service Factor. General-purpose motors in the fractional horsepower sizes are rated 40 deg C rise open for continuous duty. Motor temperatures are given in degrees Centigrade. Enclosed motors are rated 55 deg rise continuous with or without fan. Intermittent duty motors are usually 50 deg rise open with a given time specified. All temperatures are based on the motors operating in a 40 deg ambient and at less than 3300 ft above sea level. If operated under these conditions, the motor should give excellent service. Excessive temperature probably produces the greatest deteriorating effect on motors, particularly the insulation and lubrication. An old rule of thumb says that for each increase of 10 deg above the rated temperature, the life is cut in half.

With regard to temperatures, the ones specified (which are given by NEMA standards) are measured by a liquid-in-glass thermometer located against the windings. Temperature readings taken by a thermocouple tied to the winding or by the rise in resistance method will usually indicate about 10 deg higher temperatures on fractional-horsepower motors.

It has been realized for some time that the rating of 40 deg rise for open motors is very conservative. This is particularly true since many of the motors are not

TABLE 4. NEMA STANDARD SERVICE FACTORS FOR FRACTIONAL HORSEPOWER A-C MOTORS

Horsepower	Factor
1/20	1.4
1/12	1.4
1/8	1.4
1/6	1.35
1/4	1.35
1/3	1.35
1/2	1.25
3/4	1.25

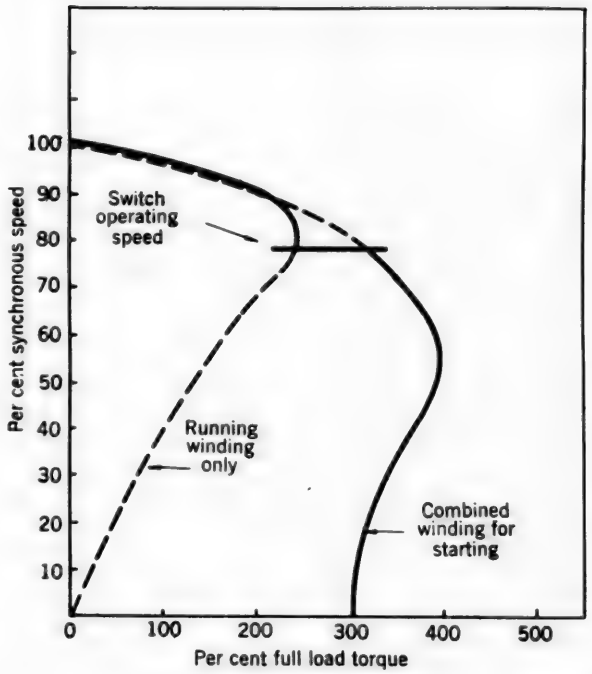


Fig. 3—Speed-torque for a capacitor-start motor.

operated continuously and are usually in an average ambient considerably below 40 deg. Therefore, NEMA has adopted a standard service factor which is listed on the nameplate as S. F. These are listed in Table 4 and apply when stamped on the manufacturer's nameplate.

This service factor means that, for example, a ¾ hp motor can be loaded to 125% of its full load without exceeding 50 deg rise.

In determining temperature rises, instruments should be used. In many fractional horsepower motors the frame temperature is more nearly that of the windings than on larger motors. A motor running 40 deg rise in a 30 deg ambient is rather cool, but is still too hot to touch. A general rule is that if one can hold ones hand on a fractional horsepower motor for a reasonable lengh of time, the motor is running fairly cool.

Multi-Speed Operation. An induction motor is used for speed control only in connection with a fan or blower. There are two methods of obtaining this speed control in a single-phase motor. The first method is by changing the number of poles using two different windings—one for the high speed, one for the low. The windings are arranged so that if one connection is used, it will operate at the speed of a four-pole motor, and if another connection is used, it will operate at the speed of six- or eight-pole motor. With this arrangement slight variations in voltage or fan load do not greatly change the operating speeds. Another method of speed control is by varying the voltage to either a shaded-pole or permanent-split capacitor motor. This method should be applied only to direct-connected fans or blowers.

In Fig. 4, the solid line *ABCD* represents the torque produced by the motor at various speeds at rated voltage. The fan or blower curve represents the torque required to drive the fan at each speed. When the output torque of the motor at a given speed equals the torque required to drive the fan at this speed, the motor will operate at

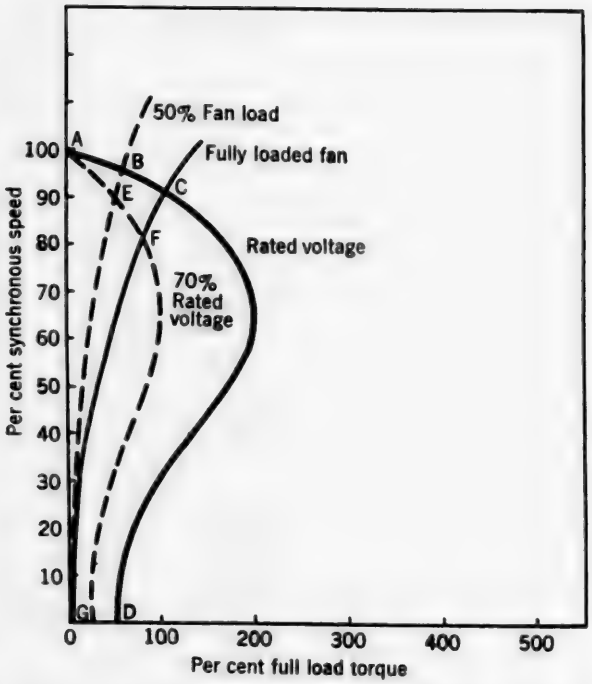


Fig. 4—Speed-torque curve for a permanent-split capacitor motor.

the speed indicated by point *C*. If the voltage to the motor is reduced, the output torque of the motor will be along line *AEFG*. Under these conditions the motor will operate at the speed of point *F*. This gives speed control by varying the voltage to a motor. This works most successfully only with fan-type loads in which torque required increases with speed and on motors having no starting switch. Any voltage setting can be used to obtain a desired speed. However, it must be realized that with low-voltage settings the starting torque is reduced so that the motor may not start. For this reason, this method of speed control is applied only to direct connected fans and blowers as the friction in a belt may prevent the motor from starting on low speeds. Also, the fan and motor must be matched to obtain proper speed control. A fan that will not properly load a motor (such as that shown in Fig. 4 as 50% fan load) will not give proper speed control. On reduced voltage, the speed would only be reduced to point *E*.

There are many methods for reducing the effective voltage to the motor. Among these are autotransformers, connecting dual-voltage motors for high voltage and applying the lower voltage, or having an intermediate winding connected into the circuit to reduce effectively the voltage to the main winding.

As one can see, variation of fan load or applied voltage will result in a variation in motor speed. Multi-speed motors ordinarily operate at a lower full-load speed with the load point nearer the breakdown or maximum torque point since this method facilitates varying the speed.

Motor Protection

Protection of motors is described in appropriate electrical codes, Underwriters' publications, and elsewhere in this article. However, attention is directed to a particular type of motor protection called inherent overheating protection. This type of protection refers to a temperature- and load-sensing device that disconnects the motor from the line when the temperature of the winding becomes excessive under any abnormal condition. Since temperature is, in many instances, the reason for motor failure, an inherent device offers ideal protection so that short overloads or delayed starting will not cause nuisance outages unless such conditions will severely damage the motor.

In fractional horsepower single-phase motors there are two windings, the starting and the main. The main winding has considerable thermal capacity and operates whenever the motor is turned on. The starting winding has relatively little thermal capacity and is connected only during starting. The inherent protector guards the starting winding by tripping out in a short time when the current is high, such as under locked-rotor conditions. It protects the main winding by being sensitive to temperature; it removes the motor from the line when the main winding temperature becomes excessive. In this manner inherent protection truly protects a motor.

Two types of protection are in common use—the automatic-reset and manual-reset types. With the automatic-reset type, the motor cools to a safe temperature and automatically resets and attempts to start. If conditions are changed so that temperatures do not then become excessive, the motor will continue its operation. If conditions are still unsafe, it will again remove the motor from the line. This cycling will continue until the motor is shut off. If for some reason it would be hazardous for a motor to start after once tripping, a manual-reset protector is used in which the operator must manually reset the protector before the motor will again start.

Which Motor to Use

In selecting the type motor to use for a given application, the characteristics of the motors outlined in Table 1

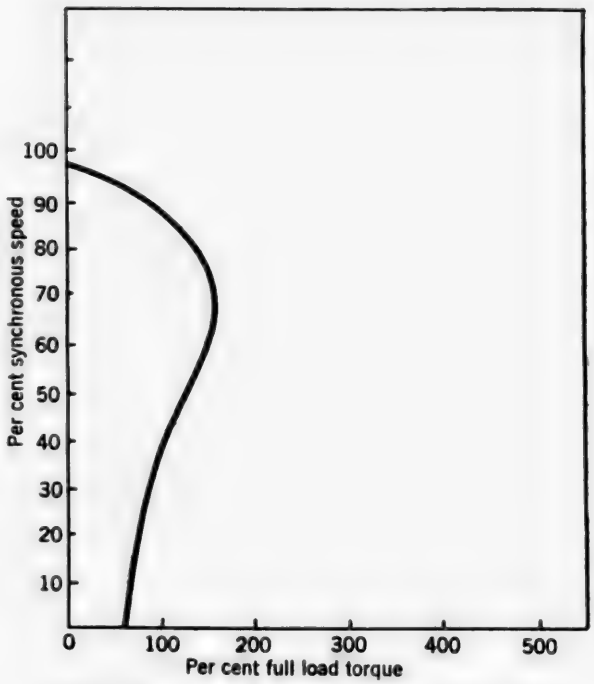


Fig. 5—Speed-torque curve of a shaded-pole motor.

should be considered. Often several types can be used.

Fans and Blowers. For shaft-mounted fans and blowers, little starting torque is required. However, some blowers have relatively high inertia and the motor must come up to speed quickly before the starting winding is damaged. Also, a long acceleration will draw a heavy current and cause lights to dim during acceleration.

In these cases, if a polyphase motor and supply are available, use them. If not, the normal-purpose split-phase motor can be used if accelerating time is not excessive. The high-starting-current, split-phase motor is the least expensive but should be used only where manual starting is used and starts are infrequent.

A two-speed, split-phase motor can be used if correct speeds can be obtained. Permanent-split capacitor or shaded-pole motor can be used if variable speed is desired. In this case, a shaded-pole motor is a low-performance motor whereas the permanent-split capacitor motor operates at higher efficiencies and power factor and lower noise levels.

TABLE 5. SUITABLE APPLICATIONS FOR FRACTIONAL HORSEPOWER MOTORS

Fig. No. and Type Motor	Suitable Applications
Fig. 1. Split-phase motor.	Motor has a starting current within the NEMA standard and is suitable for frequent starting.
Fig. 2. Split-phase motor with high starting current.	Motor has a starting current above the NEMA standard and is suitable for infrequent starting or where the higher starting current is not objectionable.
Fig. 3. Capacitor-start motor.	Motor has starting current within the NEMA standard and has high starting torque. It is suitable for general purpose use since it can start heavy loads without causing excessive light flicker on normal circuits.
Fig. 4. Permanent-split capacitor motor.	Motor has very low starting torque and low starting current. Value of capacitance of the oil-filled capacitor must be selected to provide satisfactory full load operation. With a fan-type load accurately matched to motor characteristics, this motor, with a controller, can provide very good multi-speed and dual-voltage operation.
Fig. 5. Shaded-pole motor.	Motor has very low starting torque. Speed when driving a fan-type load can be adjusted by means of a series choke coil or resistor. Low efficiency and power factor have limited its use to the smaller ratings.
Fig. 6. Polyphase motor.	Motor has good starting torque and can be used for general purpose applications wherever polyphase power is available. Breakdown torque (maximum torque a motor will develop without an abrupt drop in speed) of this motor is much higher than for corresponding single-phase motor to maintain proper full-load speed.
Fig. 7. Compound-wound d-c	Speed-torque curve for a shunt-wound motor would be somewhat similar with the no-load speed being about 10% less and the starting torque about 350% of full load torque. There is very little speed variation for these motors at normal load.
Fig. 8. Series wound d-c	Motors are used for the smaller ratings with fan-type loads.

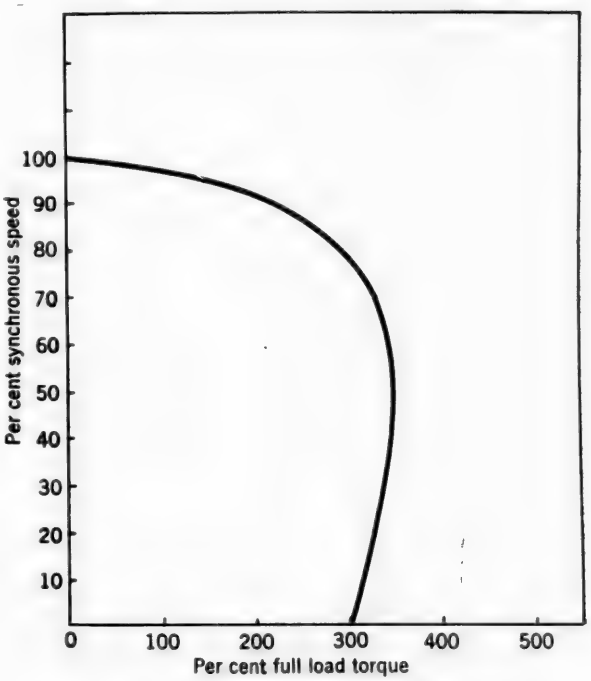


Fig. 6—Speed-torque curve of a fractional horsepower polyphase motor.

Capacitor-start motors are used when starting time must be decreased on high-inertia loads, or on larger motors where the starting torque must be greater than that produced by a normal-purpose split-phase motor.

The same remarks apply to belted fans and blowers, except that shaded-pole motors and permanent-split capacitor motors should be omitted because their inherent low starting torque is not sufficient to start a belted load under various conditions of belt tension.

Compressors. Compressor units either have the motor hermetically sealed in the unit or the motor drives a separate compressor by means of a belt. The belt-driven compressor requires a large starting torque as it may have to start under considerable back pressure with considerable friction and low line voltages. The line voltage usually drops when the motor is turned on. For these reasons the polyphase, capacitor-start a-c motors and the compound-wound d-c motors are used. Hermetic compressors for air conditioning service generally require a capacitor-start motor that has an external relay to disconnect the starting winding when the motor reaches running speed. In some cases a two-value capacitor motor can be used. A split-phase motor with relay can be used if starting torque requirements are low.

Sump Pumps. Sump pumps are usually operated very infrequently and are built as inexpensively as possible. Performance is of little importance and a high starting current split-phase motor will normally suffice. However, for a sump pump that starts regularly and often, a normal-purpose split-phase motor may be required because it has less tendency to produce flickering of lights.

Oil Burners. For oil burners the motor drives a blower and a pump, neither of which requires much starting torque. A normal-purpose split-phase motor is almost always used, except for the large commercial burners.

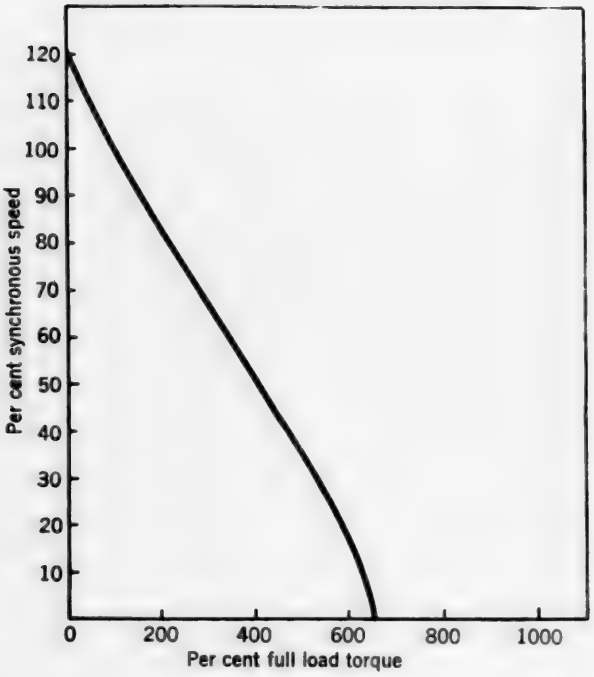


Fig. 7—Speed-torque curve for a compound-wound direct-current fractional horsepower motor.

These large units may require capacitor-start motors because of their size.

Hot-Water Pumps. Hot water pumps operate at low pressures. The normal-purpose or high-starting-current split-phase motors are satisfactory, depending on frequency of starting and running time.

Analysis of Application

A general guide in selecting a motor to drive a newly-designed machine is provided in Table 1. It is helpful to understand why a certain type of equipment is usually driven by one type of motor.

In selecting a motor for a particular application, the requirements should be studied and some of the types of motors eliminated until the choice of drive is narrowed down to one or two.

The belt-connected furnace blower application, for example, can be analyzed as follows:

Power Supply:	Usually single-phase, 60-cycle, alternating current is available.
Horsepower:	1/6, 1/4, 1/3, 1/2 or 3/4 hp depending upon the design.
Torque:	Belted blower load is fairly constant. Starting torque depends upon inertia of blower and tightness of the belt.
Locked-Rotor or Starting Current:	NEMA standards or utility regulations.
Overload Protection:	Desirable to protect the motor against unusual conditions.
Mechanical Features:	Industry standard is open, resilient-mounted motor.

Assume that information on the blower used indicates that it can supply the required amount of air when operated at the desired speed with a motor output of 0.4 hp at 1725 rpm. This would indicate a load of 1.2 times the nameplate rating of a ⅓ hp motor. Open 40 deg general-purpose motors have a service factor of 1.35 according to NEMA standards. This means that where the operating conditions are usual, such a motor will carry 1.35 times its rated horsepower without exceeding a 50 deg rise. If the ambient temperature is excessive or the motor is in a small confined space or under unusual conditions, it will not be possible to take advantage of this ability to handle extra load under favorable conditions.

If the power available is single-phase, 60-cycle, alternating current, the polyphase and direct-current motors are eliminated from consideration. The shaded-pole motor is eliminated because of the horsepower required. The starting torque of a permanent-split capacitor motor does not make it suitable for most belt-driven loads. Therefore, we have a choice between a split-phase motor and a capacitor-start motor for this application.

The choice between these two types of motors depends upon the effort required to start the blower and bring it up to operating speed. This will depend upon the tightness of the belt, the pulley ratio, and the inertia of the blower. If the belt is not too tight and the blower is light weight, it is probable that a split-phase motor will be satisfactory. On this application the motor used should meet the NEMA standards for starting current and thus the high-starting-current type of splitphase motor is not indicated. If the belt tension is high or the blower is heavy, the capacitor-start motor should be used.

On this application the motor should be provided with inherent overload protection to prevent overheating because of too much belt tension, incorrect pulley size, or incorrect installation.

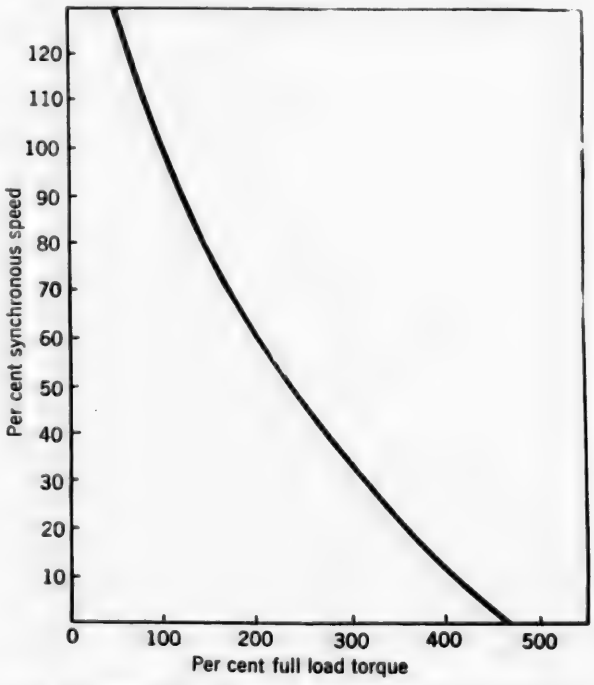


Fig. 8—Speed-torque curve for a series-wound d-c fractional horsepower motor.

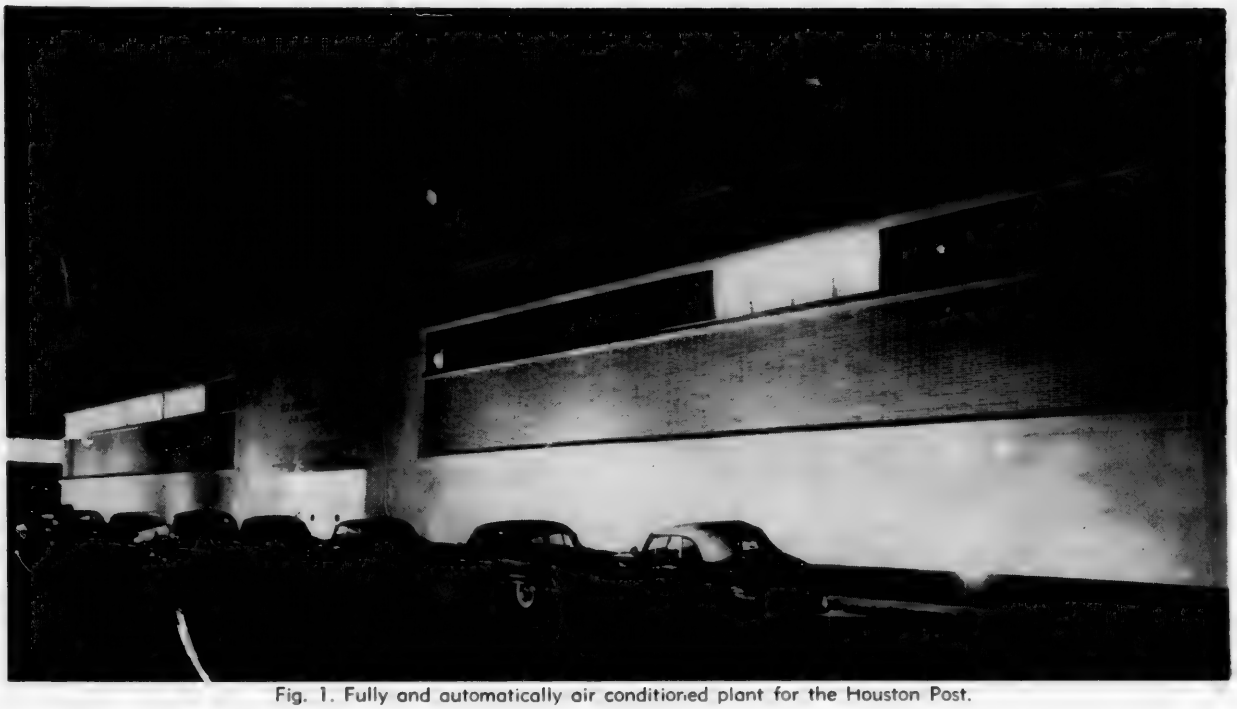


Fig. 1. Fully and automatically air conditioned plant for the Houston Post.

Centralized Automatic Operation of a Newspaper Plant Air Conditioning System

M. L. HOGLUND

Manager, Refrigeration Department, The Trane Company, La Crosse, Wis.

An electronic control panel automatically guides two centrifugal compressors through wide load variations from 20 to 400 tons in the plant and offices of the Houston Post.

DIVERSIFIED, around-the-clock activities create wide air conditioning load variations in a modern newspaper plant. From executive offices to press room, there is a demand for air conditioning to solve certain specific air problems. Cooling may be needed in one part of the building at the same time heating is required in another. An example of how typical newspaper plant air conditioning problems are handled may be illustrated with the new four-million dollar Houston Post building in Houston, Texas. Here all heating and cooling requirements are met completely and automatically.

Air Conditioning Problems

(1) The home of the Houston Post (Fig. 1) is a three story brick structure with 118,000 square feet of floor space. The building has very few windows. There are no windows on the first and third floors. On the second floor of the front section, where editorial and executive offices are located, windows extend in a continuous narrow glass band across the front and sides of the building.

(2) A giant battery of fifteen presses operate in the press room 150 feet long, 25 feet wide and three stories high. Presses are turned by 18 five-horsepower d.c. motors which generate considerable heat.

During the course of printing 120,000 papers an hour, large quantities of ink are fed to the rollers and applied to the cylindrical rotogravure plates. Naturally, such a rate of operation agitates and atomizes much ink. Ink mist constantly in the air when the high-speed rotary presses are in operation must be removed by thorough ventilation.

(3) A stereotype room on the third floor, where casts of printing type are made, keeps pots containing approximately 18 tons of molten metal on hand for this process. Located in the interior of the building, this room has no windows.

(4) A composing room on the third floor, where dozens of gas-fired typesetting machines are located, also is windowless.

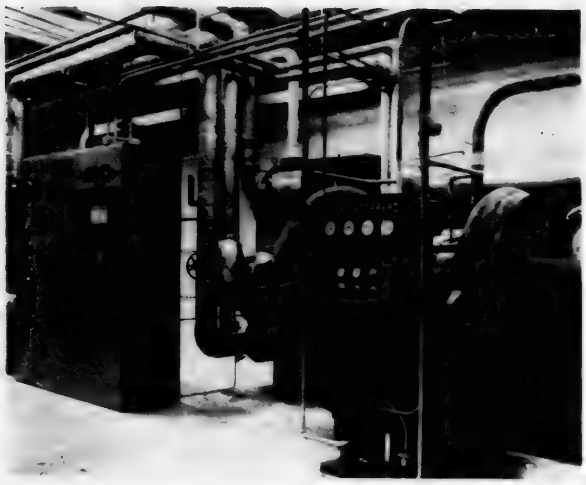


Fig. 2. Centrifugal compressor for air conditioning system. Graphic control panel is at left.

(5) The company cafeteria and kitchen on the second floor, which operates around the clock, has a large latent heat load.

(6) These factors made the majority of the air conditioning load internal. High internal load meant that some cooling would be required most of the year, regardless of outside temperatures.

(7) Also, the dry Houston climate, with six months of summer and six months of variable 20-degree to 90-degree weather, had to be considered.

Automatic Operation Specified

The managers of the Houston Post building stipulated early in the design stages of their building, that the air conditioning installation be completely automatic and designed for maximum economy of operation. Because of this requirement, the Post building is the first building in the Houston area utilizing refrigeration machines of the centrifugal type (Fig. 2) which are started and stopped automatically without supervision. The building's centifugal refrigeration machines and their associated chilled water pumps, condenser water pumps, cooling tower fans, purge pumps, oil pumps, etc., are operated by control devices which measure the actual building load. The refrigeration machines are controlled at reduced capacities if necessary to offset building load. This means a saving of horsepower consumed and a saving in operator supervisory time.

Zoning

The Post building was divided into fifteen air conditioning zones. A primary air unit, delivering 24,240 cfm, provides outdoor air and part of the heating and cooling to air handling units in individual zones. Primary air temperature can be controlled so as to provide heat to some spaces while others are cooled, even though a two-pipe system serves the air handling units. Outside air is conditioned in accordance with the basic control sequence shown in Fig. 3. Temperature is varied as outdoor temperature is varied.

Electronic controls located in the conditioned space regulate three-way mixing valves in the coil return water line to mix coil return and bypass supply water in accordance with space temperature demands. For winter heating, warm water is used in the summer cooling coils of the air handling units.

Each unit has its thermostatic action reversed by means of a thermostat attached to the unit water supply line so as to determine when water supply is changed from cooling to heating cycle and vice-versa.

Hot machines in the stereotype and composing rooms were hooded and exhausted; some were provided with radiation shields.

In the press room, the 18 press drive motors were cooled with waste ventilation air and exhausted to the outside. A utility fan suspended from the ceiling of the second floor control room withdraws air from the third floor composing room. This air does some cooling of the electrical controls in the control room and then is exhausted by another utility fan which forces it into a duct and through the press drive motors.

Even the boiler room at the rear of the first floor is air conditioned by a ceiling-hung air handling unit. The cooling coil in this unit is provided with water which has been circulated through a reheating coil in the primary air unit. In turn, the heat taken from the boiler room is used to re-heat the cooled and dehumidified air in the primary air system.

Press Room Conditioning

Three air handling units, with a combined capacity of 45,000 cfm, serve the press room. These units are not connected with the primary air unit. They have a special arrangement of controlled dampers and duct work to allow use of outdoor air for cooling during periods when the rest of the system is on the heating cycle. During the cooling cycle, when each of these units is being supplied with chilled water, they use 100% recirculated air and have thermostat control of a coil three-way mixing valve.

Whenever the supply water thermostat senses a change in water supply temperature to indicate a heating cycle, motorized outside air dampers are opened on one unit to allow this unit to use outside air. At this time, motorized exhaust dampers open to allow a portion of the supply air from the two remaining units to be discharged to the outside. Each unit thermostat controls its mixing valve in accordance with the space demand for heating. The unit utilizing outside air has an additional thermostat located in the air supply stream to act as a low limit

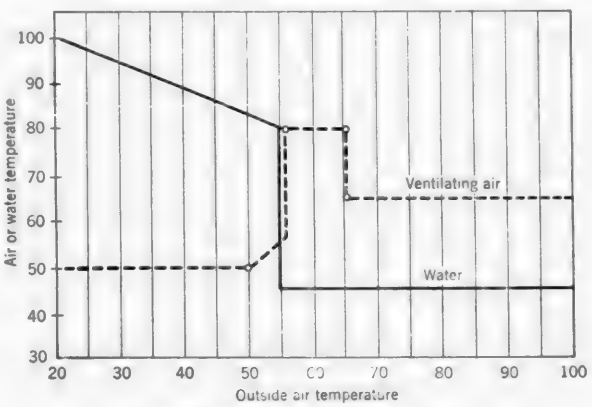


Fig. 3. Basic control sequence.

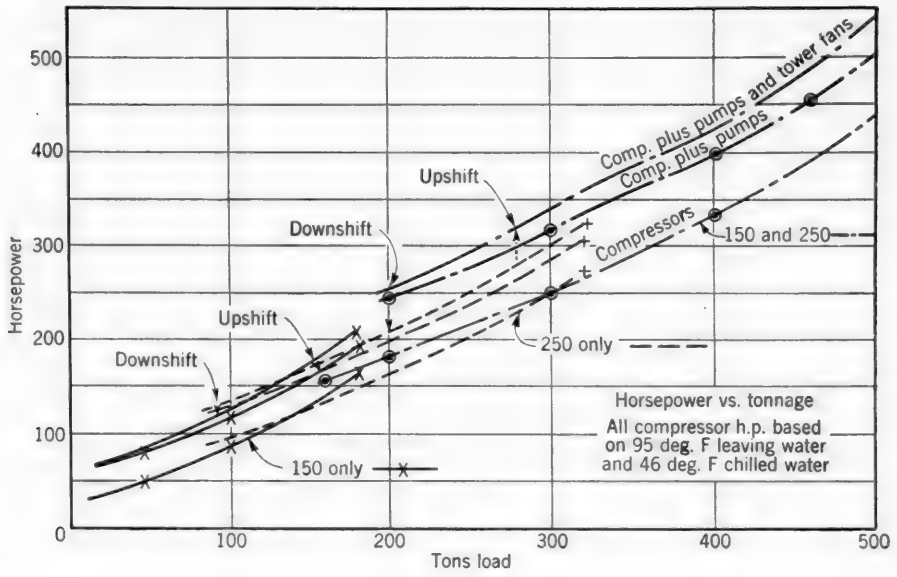


Fig. 4. Horsepower vs. tonnage load.

thermostat to throttle the outside dampers towards close position, should supply air drop below 45 deg. Outside air dampers are closed at 35 deg supply air temperature.

Instrumentation

Supply water to all fan and coil units and the primary air unit is changed from hot to chilled water simultaneously. This changeover is automatic as determined by outdoor temperature.

Whenever outdoor temperature is above 50 deg, chilled water is supplied to all units. The hot water supply pump is stopped and the chilled water circulating pumps are able to start under command of the refrigeration load controller.

In order to provide maximum economy of operation, starting and stopping of these machines with their respective chilled water pumps are determined by instruments measuring refrigeration load conditions.

A non-indicating, electronic differential temperature controller measures temperature differential between the chilled water return and supply chilled water supply. This instrument transmits a pneumatic air pressure of 3 to 13 psi as differential temperature varies between 0 and 15 deg. The relationship between transmitted air pressure and differential temperature change is a linear function with provision made at the instruments to fully adjust the pounds air pressure change per degree change in differential temperature.

A differential converter is located at a flange-connected orifice plate placed in the main chilled water supply line. This instrument transmits a pneumatic signal which varies from 3 to 13 psi as chilled water varies from 0 to 100 gpm. The air pressure transmitted is proportional to the square of the flow.

The air pressure transmission from the differential temperature instrument and the differential converter for flow detection is piped into a pneumatic ratio relay which, in turn, transmits the sum of these two air pressures to a Duplex indicating pressure controller. This pressure controller then transmits an air pressure which varies from 3 to 13 psi in direct proportion to its input pressure of 6 to 26 psi.

The Duplex pressure controller is set to operate pneumatic diverting relays, which are arranged to start and stop the refrigeration machine in the following sequence as input pressure to this controller is varied to indicate a change in system capacity as desired.

The 500 gpm pump is started manually. The refrigeration temperature controller for the 150-ton refrigeration machine then begins to control this machine's suction damper to maintain chilled water supply temperature at 46 deg. A pneumatic electric switch starts this machine through its control panel.

Whenever the flow and differential temperature instruments of this 150-ton machine indicate the machine is operating at 150-ton load, the 700 gpm chilled water pump is started. The 250-ton refrigeration machine is started under control of a chilled water temperature controller, a 150-ton refrigeration machine stops, and its 500 gpm chilled water pump stops after a pre-set time delay. The 250-ton machine suction damper is then controlled to maintain 46 deg supply water temperature.

When load is increased to indicate that operation of number two machine has reached 250 tons, the 150-ton machine and its chilled water pump is started and operates under control of its refrigeration controller. Both machines continue to operate as long as load indication is between 250 and 400 tons.

On a decrease in load indication to approximately 200 tons, the 150-ton machine and its chilled water pump are stopped.

The 250-ton machine operates until load indication decreases to approximately 90 tons, at which point the 150-ton machine and its chilled water pump are started and the 250-ton machine and its 700 gpm chilled water pump are stopped.

The 500 gpm chilled water pump continue to run whenever load indication is less than 90 tons unless stopped manually. The refrigeration controller for the 150-ton machine stops this machine whenever it has reached approximately 20% capacity.

Individual chilled water temperature controllers on each machine have a miniature indicator providing remote indication, remote reset of control point, and remote selec-

tion of manual or automatic operation. A miniature two-point strip chart recorder receives and records transmissions from the differential temperature instrument and the chilled water supply instrument. Miniature indicating flow meters with their respective pneumatic transmitters indicate condensed water flow and hot water flow during the heating cycle.

Graphic Control Panel

All receivers for instruments are mounted on a graphic control panel, shown in Fig. 2. Water flow is indicated by direction arrows mounted on the panel. This panel illustrates graphically the mechanical system's circuitry for chilled and hot water to the building, the condenser and cooling tower water circuits and the air stream temperatures. Water flow circuits, pumps, coils and so on are depicted by means of anodized aluminum and colored plastic strips. The basic idea of the color graphic panel is to depict an operation in its entirety and not in a number of disassociated increments as is commonly the case.

Completely automatic operation of the air conditioning system frees a full-time engineer for other duties. Normally a cooling plant of this size requires his full attention.

Heating Cycle

Whenever outdoor temperature is below 50 deg, the supply water system is on a heating cycle. Refrigeration is stopped, steam boiler operates, and the main system hot water circulating pump is started.

Hot water supply temperature is controlled at the hot water converter. An insertion thermostat is located in the hot water supply to operate a motorized steam valve in steam supply to the converter. Hot water supply temperature is reset as shown in Fig. 3 as outdoor temperature changes.

Power Consumption vs. Load Requirement

As the refrigeration system automatically adjusts to varying cooling requirements, power consumption is reduced in almost direct proportion to load. Fig. 4 shows curves of horsepower versus tons load. The bottom curves give the horsepower required by the refrigeration machines only. A second set of curves indicate the horsepower consumed by the machines plus the pumps. The top curves show total consumption of the refrigeration machines, pumps and cooling tower fans.

In Fig. 4, "down shift" and "up shift" are indicated. "Up shift" means the 150-ton refrigeration machine is cut off and the 250-ton machine is in operation, or the 150-ton machine is operating in addition to the 250-ton machine.

The Houston Post building was constructed in eleven months. The air conditioning system was installed for less than $500 per ton. All air conditioning equipment was manufactured by The Trane Company, La Crosse, Wisconsin, controls by Minneapolis-Honeywell.

Herbert Voelker and Associates, architects and engineers of Houston, prepared the plans and specifications for the building.

Steam Service and Air Conditioning for a Mental Hospital

There is nothing conservative and very little that can be considered commonplace about New Jersey's $21 million state mental hospital at Ancora. At completion, when its extensive wards, cottages, and "disturbed" buildings are fully staffed and tenanted, 2700 patients and 800 full time members of the professional staff will occupy the center's twenty-two major buildings.

In the important sphere of heating, ventilating and air conditioning, a great deal has been done to provide inmates and personnel with balanced and uniform temperatures for maintaining the kind of atmospheric environment that is conducive to physical and emotional well being and recovery. Air conditioning and steam radiation serving every major building have been engineered to produce comfort with an absolute minimum of human direction or maintenance.

Seven to fourteen separate networks drawing steam from the main loop serve each of the hospital's main buildings, and through zoning several advantages are realized. A failure can be located with a minimum of tracing and is contained in one small segment of the system. Intensive zoning localizes faults and thus speeds the work required to repair a ruptured or malfunctioning line.

The source of the 7 psi steam that is utilized for general heating is a 6-mile high-pressure steam main transmitting 125 psi steam generated at a boiler house enclosing three Babcock & Wilcox package boilers. The reduction of high pressures to 7 psi at header points that branch off the main loop is performed by Atlas pressure reducing valves and temperature regulators, as is the reduction of high pressures to 40 psi steam for energizing cooking and sterilizing equipment. Low pressure steam is used to heat domestic hot water stored in large quantities at numerous points of consumption throughout the hospital.

Year-round air conditioning for the observation and operating rooms assures not only stable and comfortable temperatures, but, most importantly, dehumidifies the operating areas to prevent static electricity from discharging and igniting fumes that are unavoidably released during anesthesia. Central station equipment is situated in a penthouse compartment above the surgical suites and can operate at full 25.9 ton capacity.—ALEX KAY, Engineer, Charles Simkin & Sons, Inc.

ALL THREE of the Reference Sections on HIGH TEMPERATURE WATER, by Owen S. Lieberg, will be bound together as a 32-page covered booklet available soon for $1.50 postpaid.

Order now or write for quantity prices. Editor.

AIR CONDITIONING, HEATING AND VENTILATING
93 Worth St., New York 13, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING'S

High Temperature Water

Part 5

OWEN S. LIEBERG

Consultant, Cosentini Associates, New York, N. Y.

This is the third and concluding reference section on high temperature water, previous parts having been published in September and November issues. This section deals with the economics of design and describes typical systems.

AIR CONDITIONING, HEATING AND VENTILATING — JANUARY, 1956

High Temperature Water

OWEN S. LIEBERG

Consultant, Cosentini Associates, New York, N. Y.

Part 5. Typical Systems and Economics

HUNDREDS of high temperature water systems are in use in Europe, but we, in America, are no longer dependent on Europe for our technical or economic information, or for performance data. There are enough high temperature water systems working satisfactorily in this country and Canada to answer all these questions. High temperature water is a proven method of heat distribution. It works and works well.

Two of the earliest of the American systems were installed in 1940, and these two pioneer installations have, since that time, been greatly extended not only in buildings and areas served, but also in the end use of heat.

Since the war, the use of high temperature water for the transport and distribution of heat, has been adopted by the U. S. Department of Defence for Air Force Bases, Naval Shore Establishments and Military projects.

At one such Air Force Base, high temperature water was selected as the heat distributing medium for all its various buildings, warehouses and hangars, etc. It has one central heating plant with three hot water generators (or boilers as they would normally be termed for a steam plant), which are of the water tube type for controlled, forced circulation. They operate at 275 psig (415 deg F equivalent). The specified rating for each boiler or generator is 50,000,000 Btu per hr, maximum continuous, using No. 6 fuel oil. Water from the expansion drum enters the distribution system circulation pumps which discharge it into the system, at 375 psig. There are 98 buildings requiring heat; some, such as the warehouses, being heated directly with the high temperature water at full pressure. Others, such as living quarters, mess halls and others are heated with low pressure hot water. Unit heaters are connected directly into the high temperature water lines but the baseboard convectors in the living quarters, in the operational and medical buildings and elsewhere, are heated with low pressure low temperature water. This is pumped from the secondary circuit of the heat exchangers in the Utility Rooms, the primary circuit (385 deg) being connected into the high temperature water lines.

Where steam is required for sterilizers, cooking or other uses, a separate "high temperature water to steam" heat exchanger is installed. For sterilizers, the steam pressure is 45 to 50 psig, for cooking, 10 to 15 psig, in other buildings, 30 psig. All operate independently of the others with their individual separate controls. If there were no central boiler plant, separate boilers would be necessary in each building, requiring a licensed engineer to be in attendance in every boiler room. Heat exchangers require no such attendant. At this base, there are three zones with over 76,000 ft or almost 14½ miles of main piping. The base is similar in many respects to almost a dozen other

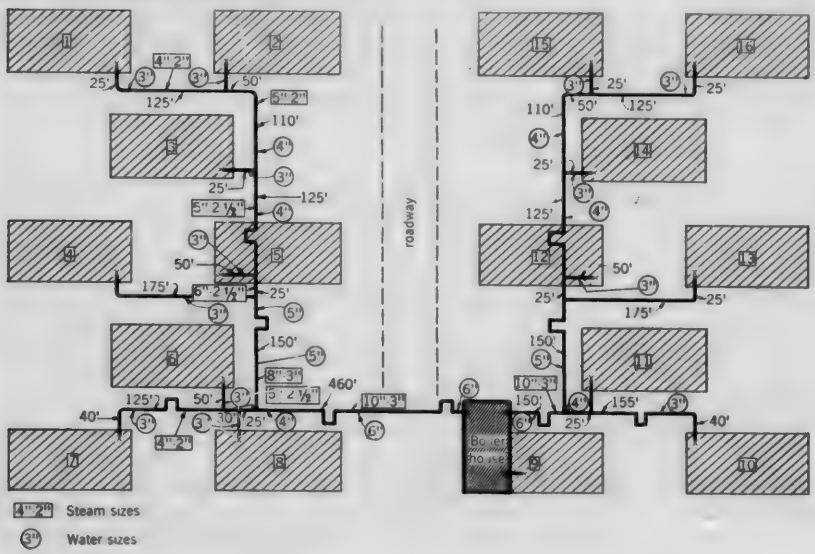


Fig. 27. Pipe size comparison for system laid out for HTW (350 deg) and HP steam (125 psi).

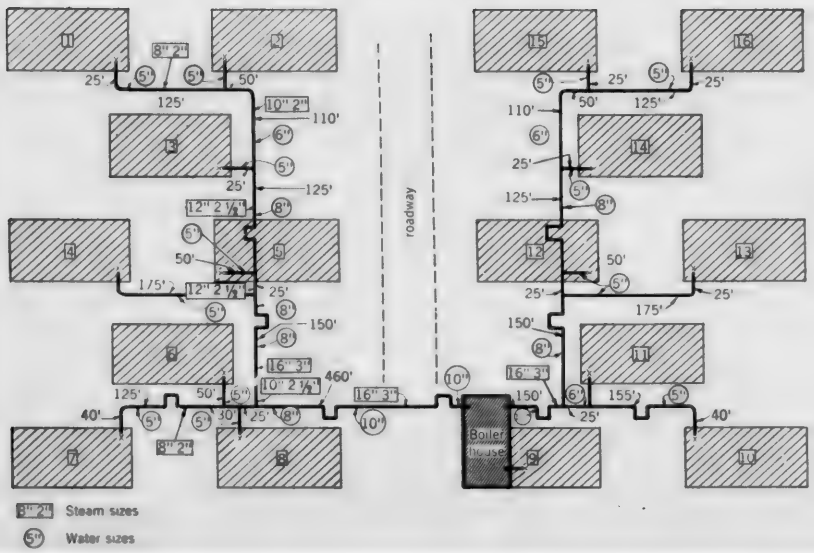


Fig. 28. Same system as Fig. 27 but laid out to compare pipe sizes for LPW (250 deg) and LP Steam (15 psi).

U. S. Air Force Bases all using high temperature water for heat distribution, the boiler plants varying from 150 million to 300 million Btu per hr.

Apart from such government installations, there are also factories where individual buildings are separated by distances of 1,000 ft or more. One such plant is served by three 50 million Btu per hr boilers generating high temperature water at 380 deg. One building is ¾ mile away, another building is almost 1 mile away. Heat exchangers supply hot water at low and medium temperatures according to the individual load. Other heat exchangers generate steam at pressures ranging from 10 psig to 125 psig; the latter being steam for a paper mill in one of the buildings. A typical advantage of distributing high temperature water is illustrated at this factory, in that steam pressures do not fluctuate, but are held constant by the flywheel effect of heat storage.

This constant supply of steam or hot water at uniform pressures and temperatures is again illustrated at another factory where high temperature water was first used in a small section of the factory in 1940. Today, most of the buildings are using high temperature water for space heating and for process heating. At this same factory, a few years ago, an extension was planned. It was decided to test some cooking kettles with high temperature water and steam to compare the temperature regulation between the two systems. After some weeks of testing under similar conditions but varied only according to the process requirements, the factory management were unanimous in selecting high temperature water for the factory extension, because of the very close temperature control possible with this medium. This factory has two boilers each 40 million Btu per hr, fired with pulverized coal.

From Zurich, Switzerland, come the following interesting facts regarding the district heating system at the Federal Technical Institute.

Users of heat.

(1) All the school buildings.
(2) Public buildings of the City and County of Zurich, including the County Hospital.
(3) Private buildings.

Approximately 80% of the distribution system's yearly heat consumption is used for space heating. The remainder is used for technical purposes, including domestic hot water. The heating load is based on the maximum heat output per hour with an outside temperature of minus 5 deg.

Space heating. Low pressure hot water, 248 deg.
High temperature water 156 psia (360 deg).
Process steam. Steam at 28 psia.
Domestic use. Domestic hot water at 158 deg.

In a radius of approximately 200 feet from the central heating plant, the pipe lines are run in tunnels or in the basements of buildings. The remainder of the 5 miles of pipe lines are underground providing a total of 198 buildings with over 11 million Btu per hr.

Whitehall System

One of the largest municipal district heating systems in Europe supplies heating by high temperature water for many of the government buildings in or adjacent to Whitehall in London, England. This system was originally designed before World War II, but it was not until 1946 that engineering designs were recommended. By this time many more government buildings were added to the pre-war plans. Originally it had been proposed to fire the boilers with coal, which, of course meant coal bunkers, ash conveyors, hoists and flue gas washing equipment. Since that involved the trucking of thousands of tons of solid fuel and hundreds of tons of ash each week it was decided, when the project finally reached the planning stage, to substitute liquid fuel.

The boiler house is designed for a total continuous output of 140 million Btu per hr. Three boilers have already been installed and are in operation, and there is space for three more. These boilers are of the controlled forced circulation water tube type with flow and return temperatures at the boiler of 320 and 220 deg respectively. It was first proposed to use a steam-water expansion drum which would accommodate the change in volume of the

water in the system through fluctuations in temperature. But, this would have required 2 expansion drums each 20 ft long and 6 ft in diameter, space for which presented a serious problem through demands by other departments in the building. It was therefore decided to use a pressurised system with a vertical pressure vessel 12 ft high and 4 ft in diameter. After some research, nitrogen gas was used instead of compressed air in order to prevent corrosion. A connection at the bottom of this pressure tank is taken to the main system return header. An increase in volume of the system water causes the water level to rise in the pressure tank, which in turn causes a pressure rise in the nitrogen cushion above the water level. When this pressure reaches a predetermined value, excess water passes through a diaphragm controlled valve to the head tank located in the roof. When, however, the system high temperature water contracts in volume, the pressure falls and pumps restore the pressure by taking water from the head tank. With this pressurized system, fluctuations in volume are taken first by the pressure tank and then if necessary by the head tank.

Although the pressurized vessel system is lower in first cost, due mainly to the cheaper pressure tank when compared to the large steam-water expansion tank or tanks, the operating costs are higher due to the replacement costs of providing nitrogen, by cylinder, and operational costs of the compressor.

The boilers are fired with cresote-pitch from four steel lined concrete tanks which are heated by hot water coils immersed in the fuel at the lower level. Standby electric heaters are provided. The system circulating pumps are connected on the return side of the system and pump directly into the boilers with a by-pass line to the system flow header.

The system was designed to supply heat to 7 government buildings including the War Office, and with extensions to other government buildings such as the Treasury, Downing Street, Foreign Office and others to make a planned total of over 140 million Btu per hr, of which 67½ millions represent the present connected load. To install the large supply and return lines, it was necessary to use existing basements and tunnels, which involved many changes in direction. These directional changes are an advantage as they help to solve the expansion and contraction of such a system. With an overall thermal efficiency of 75%, under full load conditions, the operational costs for the first part of the system that is for the load of 67½ million Btu per hr, is as follows:

Fuel	$27.30 per hour
Electric power	2.85 per hour
Labor, supervision	2.78 per hour
Total cost per million Btu per hr	$0.49

At higher loads, it is anticipated that the overall thermal efficiency will be improved.

Steam-HTW Comparison

A study was made recently to evaluate the differences, the advantages and disadvantages, between steam and hot water when used for the distribution of heat in a housing project comprising 16 apartment blocks, all heated from a central boiler house. See Fig. 27 and 28. A typical

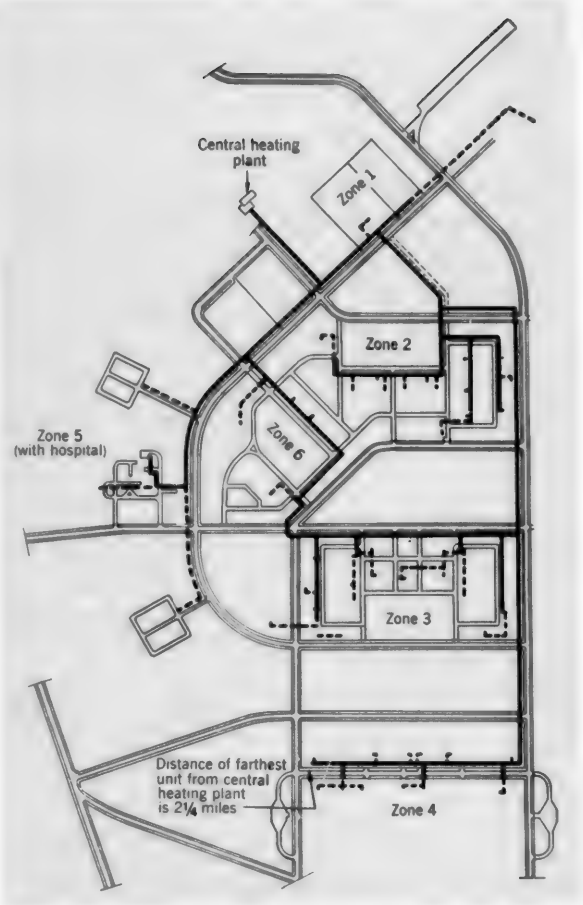


Fig. 29. Canadian Army Camp with HTW distribution for all services.

housing unit was taken; each apartment block having 12 floors with 12 to 16 apartments on each floor. Including domestic hot water requirements, the total estimated heat loss, per unit of 160 apartments, was 4 million Btu per hour, or a total of 64 million Btu per hour for the entire project.

Six methods of heat distribution were examined, (a) Steam at 15, 55, and 100 to 125 psig; and (b) Hot water at 250, 300, and 350 deg. The intermediate systems, steam at 55 psig and hot water at 300 deg, while offering certain advantages in first cost, when compared with steam at 15 psig or hot water at 250 deg, were not recommended since both systems require licensed engineers to operate the boiler plant. The alternative systems have therefore been shown in Fig. 27 and 28 with distribution piping sized for the heat loads required and the design temperature drop recommended.

The advantage of steam at 15 psig or hot water at 250 deg is the employment of a boiler room attendant instead of a licensed engineer. On large projects where distances between buildings are considerable or where the main pipe line to the farthest building requiring heat is such that a high pressure drop for steam, or high temperature drop for hot water is necessary, then low pressure steam at 15 psig or hot water at 250 deg cannot be used economically. The advantages and disadvantages of hot water for a housing project can therefore be summarized as follows:

Steam: 15 psig	*Hot Water: 250 degrees F*
Advantages	
No licensed Engineer required. Boiler attendant only.	No licensed Engineer required. Boiler attendant only. Distribution pipe is smaller than that used for steam. No steam traps. No grading required for piping. No condensate receiving tanks and condensate return pumps. No corrosion in condensate lines.
Disadvantages	
Required for steam: Steam traps. Larger pipes. Condensate receivers and pumps. Feed Water make-up must be treated. Pipes must be carefully graded, if buildings are far apart; grading changes may require condensate pumps, etc.	System circulating pumps required for distribution of hot water.
Steam: 100 to 125 psig	*Hot water: 350 deg.*
Advantages	
Distribution supply piping is smaller than with low pressure steam.	Distribution supply and return piping is smaller than that required for either steam at 15 or 125 psig, or hot water at 250 deg. *Note:* The advantages enumerated above under hot water (3) to (6) also apply.
Disadvantages	
Licensed Engineers required in most States. *Note:* The disadvantages enumerated above, under steam at 15 psig, also apply to steam at 125 psig.	Licensed Engineers required in most States. System circulating pumps required for distribution.

It was therefore concluded after comparing capital costs, maintenance and operating costs, that the high temperature water system at 350 deg with its marked decrease in pipe diameters was more advantageous than steam at any pressure. The elimination of steam traps, pressure reducing valves, condensate receivers and pumps, with the neccessity of maintaining a skilled staff for this work, is obviously a costly addition for such a housing development. Maintenance and operating costs are recurring expenditures for the life of the project, with replacement costs increasing as the years go by. The elimination therefore, of any equipment which would simplify maintenance, is obviously desirable in every way.

A comparison of costs for both types of system for this housing projects are tabulated. It should be noted that boilers with a higher output are necessary for steam, when compared with hot water. This, as explained in Part 2, is due to the large thermal storage in the hot water system, which acts as an accumulator. The hot water boilers therefore, only serve to maintain this thermal accumulator, whereas with steam, the accumulator effect or thermal reserve is almost negligible.

	Steam	*High Temp. Water*
	25,000	20,000,000
Boiler Plant.	3 Boilers:	3 Boilers:
Total Cost:	lb per hr each	Btu per hr each
Including boilers, pumps, piping, erection, labor piping, erection, labor (deaerator and feed water treatment plant for steam), system pumps for high temp. water	$242,800.00	$229,665.00
Distribution:		
Piping, insulation and conduit or concrete installed. (Steam traps, etc., for steam).	84,000.00	73,000.00
Building Services:		
Converters for H T W press. red. valves for steam, controls for dom. hot water, condens. receivers and pumps for steam.	102,800.00	91,000.00
Total.	$429,600.00	$394,015.00

The figures shown do not include any costs which are common to both systems, such as excavation and backfill for distribution lines, internal heating systems in the apartment blocks, etc.

Estimated Operating and Maintenance Costs (Annual).

	Steam	*High Temperature Water*
Fuel costs, inspection, minor repairs, maintenance, electric power, (feed water treatment for steam).	$105,600.00	$84,750.00

Savings with high temperature water $20,850.00 or 19.7% These savings correspond closely with other installations where comparative operating and maintenance costs have been collected.

Naval Station

The high temperature water system installed at Tufts Cove, Halifax, Nova Scotia, for the Canadian Navy, supplies heat for the Married Quarters at this shore establishment. The system has been in use for several years and has given entire satisfaction in every way. The heating requirements for the buildings are not only up to the high standard required for naval work, but the maintenance and operational costs have shown a marked decrease from known standards for steam.

This system, designed by Wiggs, Walford, Frost & Lindsay, Canadian consulting engineers, provides hot water at 300 deg to 87 apartment blocks varying in size from 5 to 7 apartment units each. Through heat exchangers, one for domestic hot water and one for space heating through a normal convector system, the temperature is reduced to 200 deg at each building. When this system was installed, boilers of the H.R.T. type were used. Whereas this type of boiler does not offer the many advantages of the water tube boiler, designed especially for high temperature water, these were the only ones available at the time. The high temperature water is drawn from the boilers just below the steam-water line. It is now realized that such a boiler is limited in output and does not provide the water expansion requirements of a system distributing heat over a large area. Several H.R.T. boilers are therefore necessary where only one water tube boiler would otherwise be installed. Also a system with a number of H.R.T. boilers connected into one header requires careful balancing and operational control.

An interesting feature at Tufts Cove is that a school was added after completion of the design of the heating system. Since this school, a standard naval unit designed for steam, was different to the other buildings already completed and in operation, arrangements were made to provide the steam for heating by the use of a heat converter or steam generator, which was supplied with 300 deg water from the high temperature water system. Although the school heat load was much higher than estimated at the time of preparing the original engineering design, it was absorbed into the system without difficulty.

Army Camp

Following the successful operation of the high temperature water at Tufts Cove, it was decided to investigate the possibility of its use for the new Canadian Army establishment at Camp Gagetown, New Brunswick. At this army camp, one of the largest on the North American Continent, over 100 buildings were planned, with more to be added in the future.

However, before it was decided to use high temperature water, a comparative study was ordered by the Canadian Government to evaluate the claims of high temperature water and high pressure steam and the economic advantages of either system. The camp buildings located on a relatively small portion of the Military Training Area, were so planned that it was necessary for many reasons to put the central boiler house at one end of, and not as is technically desirable and economically advantageous, in the center of the buildings to be heated.

It was quickly realized that, because of the topography of the camp site, the steam supply line would require many changes in level, necessitating steam traps and drip points. Further, the cost of the tunnels in which all services, water, telephones, electric as well as the heating lines, would be installed for military reasons, would be greatly increased because of the grading involved. The pumped condensate return, requiring receivers and pumping units, etc., would also greatly add to the operational costs.

From the experience gained at Tuft's Cove, the consulting engineers were able to report in an unprejudiced way that "while there was little difference in capital costs of the two systems, with the high temperature water system slightly lower, the operating and maintenance costs would be appreciably lower than that of the equivalent high pressure steam system."

They also reported that the high temperature water system possesses the previously described advantages over a high pressure steam system.

The consulting engineers therefore strongly recommended the use of high temperature water for this project in a system shown in Fig. 29.

To make such a study and to issue such a well prepared report, a common basis of comparison had to be adopted. Once the heating load of each building was established, a radial feeder or zone system of heat distribution was used, with the various radial feeders diminishing in size as they extended from the central boiler house. This system was recognized as requiring the lowest initial capital cost and because such a system could be applied for either type of heating medium.

Sections of pipe lines were valved so that should a fault develop in any section of a feeder or distribution zone, the whole feeder, or a part, could be shut off and isolated from the rest of the system. In this way, the same piping layout for steam and hot water was used, each being sized according to the characteristics of each. The following brief description of the two systems will help the reader to realise the care taken by the consulting engineers to evaluate both systems fairly.

To provide the heat required in all buildings, whether for process or space heating, a supply temperature of 365 to 370 deg was specified. The equipment selected differed very little from that used for either system. The valves for high temperature water would have to be of the cast iron body type with stainless steel seats and discs. The heat exchangers for the generation of domestic hot water or low pressure steam would be of standard type shell and steel tubes, while the system circulating pumps for the hot water would be designed for the high temperatures involved and would have stainless steel impellers, etc.

It was decided that the high pressure steam would be of conventional design. Leaving the central boiler house at the higher pressure, it would be reduced to 30 psig and supplied at this pressure to the heat exchangers (for domestic hot water, unit heaters and the kitchen or hospital equipment). All condensate would be returned to the central boiler house.

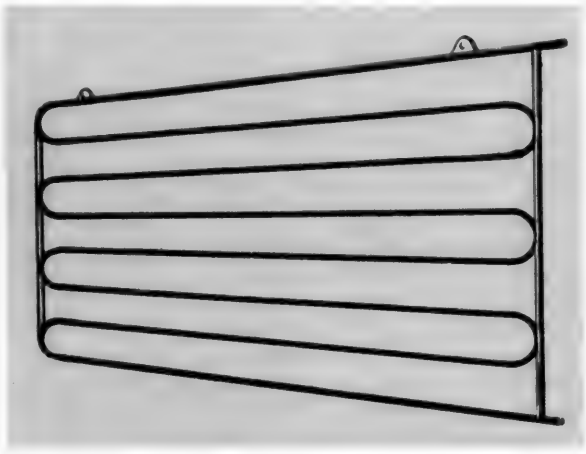


Fig. 30. HTW radiant panel.

It was realized that the steam lines would undergo many changes in level which would necessitate drips and traps at all low points. Between tunnels and the buildings or wherever an underground conduit system was contemplated, each drip point would require a man-hole. All of these conditions were examined in the overall comparison.

The design of the local heating services within the building was also carefully considered for both systems and adapted accordingly. In many buildings, high temperature water heating permitted the use of high temperature water radiant panels such as that shown in Fig. 30. In warehouses, tank repair shops and similar buildings panels could be used instead of unit heaters at some saving in capital and maintenance. High temperature radiant panels have been found to be very satisfactory in factories employing light labor and sedentary workers where the mounting height is not less than 10 feet from the floor level, and where the occupants are in the direct path of the heat rays to receive the greater part of the heat transmitted.

Such radiant heating panels do not need electric motors and thus reduce maintenance costs. A typical standard panel measures 6 ft by 3 ft, and for a mean temperature of 300 deg, will give an emission of 8,838 Btu per hr from the front of the plate and 1,134 Btu per hr from the back to give a total heat emission of almost 10,000 Btu per hr, or approximately 550 Btu per (sq ft) (hr).

The main advantage of steam is that it is a widely known heat medium. Equipment is conventional and readily available, but with the progress of high temperature water, this is no longer a singular advantage. While on level ground the tunnel and conduit space required is not a complicated one, on rising ground or when levels change sharply, steam is at a disadvantage. At Camp Gagetown, the tunnels dip at every road junction and intersection. Two designs were therefore prepared for steam and hot water. To give a true picture of the maintenance and repair problem, it was found that there would be required for steam, the following:

150 safety valves
1000 traps
1050 strainers
150 pumps and receivers
400 dirt pockets
300 pressure reducing valves.

Comparative figures are as follows:

Capital Costs. (Boiler plant of 210 million Btu per hr.)

High Pressure Steam	*High Temperature Water*
$2,784,480.00	$2,775,270.00

Operating and Maintenance Costs. (Based on data collected from existing systems.)

	Steam	*High Temperature Water*
Coal costs	$346,500.00	$282,000.00
Inspection and minor repairs	18,720.00	6,240.00
Plant labor on repairs	10,395.00	8,460.00
Plant maintenance	10,395.00	8,460.00
Labor	18,000.00	18,000.00
Electric power	17,000.00	20,600.00
Feed water treatment	1,400.00	.....
Total	$422,410.00	$343,760.00

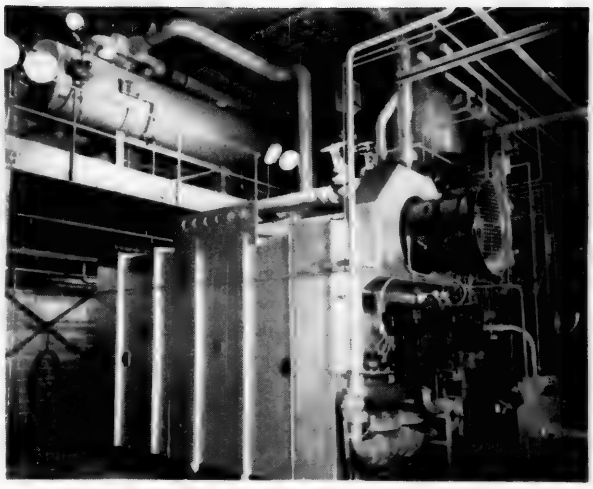


Fig. 31. Babcock and Wilcox type FMD integral boiler with elevated surge tank serving HTW system at Chanute Air Force Base.

Estimated yearly saving in favor of high temperature water of $78,650.00 or approximately 18%.

Therefore, since the economic advantages of high temperature water were so convincing, it was decided to use it in preference to steam.

The central boiler plant at Camp Gagetown is designed with 4 water tube boilers of the controlled forced circulation type, each having a rated continuous output of 70,000,000 Btu per hr. The 26 miles of external distributing piping are run entirely in tunnels which pass under numerous roads in the training area and are usually located underneath the side walks. At the initial point of entry, six high temperature water lines (4 of 10 inches diameter and 2 of 8 inches diameter, with a standby line to the hospital) occupy the same tunnel, serving all 3 main zones.

Air Force Base

The Chanute Air Force Base is an example where steam boilers (Fig. 31) have been used for the generation of high temperature water. This of course, involves the use of two steam-water drums, one being the steam drum of the boiler, and the other a cascade heater or direct water and steam mixing and surge tank (Fig. 32). While the ultimate achievement is the generation of high temperature water to any predetermined pressure, steam boilers for this system require unnecessary blow-down and feed

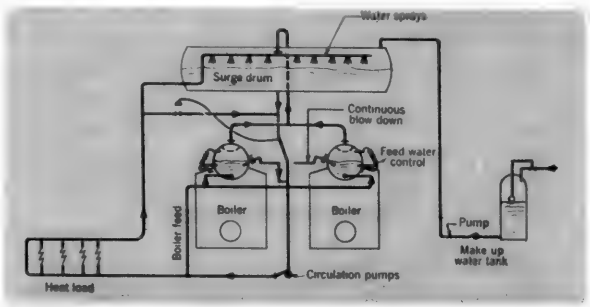


Fig. 32. High temperature water generated in surge tank with steam from B & W boilers at Chanute Air Force Base.

water treatment in excess of that required by forced circulation water tube boilers in which no steam is generated.

It does, however, illustrate an interesting fact. Many existing heating systems using steam boilers can be economically converted to high temperature water without removing the existing boilers; only the pipe lines, valves and fittings having to be changed. Such conversion of existing steam boilers presents only a minor problem and one which does not entail much expense. It gives owners and engineers an opportunity to get all the advantages of high temperature water distribution (operational savings, heat control, etc.) without the high cost which would otherwise be necessary if new boiler plant had to be purchased.

The Chanute Air Force Base boilers are rated at 18,000,000 Btu per hr each, to generate water at 325 deg.

Pimlico

Another very large district heating system which has been installed in London, England, since World War II, takes steam from the Battersea Power Station, as described in Part 1. This system has proved that high temperature water is flexible in design and can be adapted to variable requirements and existing conditions. The Pimlico Housing Development, as it is called, covers an area of 30 acres with 1,640 apartments in over 50 blocks. Most of the buildings range from 8 to 11 storys high with apartments varying from 1 to 5 rooms each. There is also a community and youth center, kindergarten, day nurseries, stores, two schools and a church. One of the schools and the church were existing at the time the system was planned and later connected into the distribution lines.

Adjacent to the above development was an existing large block of apartments, Dolphin Square, built before World War II with over 1200 apartments of varying sizes. To the north, another block of apartments with 74 units has also been connected into the main system, which, together with Dolphin Square make a total of approximately 2900 apartments served by this district heating system. This is equivalent to a population of over 10,000 people.

It is of interest to note that the Dolphin Square apartments had three existing boiler houses, built with the apartments before World War II, but these are no longer required, as the heat from the central district heating system is more economical. This is but one example of where generation of electricity can be combined with the generation of heat from back pressure turbines to improve the overall efficiency and better utiliation of plant.

The maximum demand for heat at Pimlico, as given by A. E. Margolis, engineer with Kennedy and Donkin, the consulting engineers, is as follows:

City Housing	*Approx. Btu per hr*
Space heating for apartments	28,000,000
Domestic hot water	12,250,000
Other buildings, heating and hot water	7,000,000
Adjacent	
Apartments, units added (Dolphin Square, etc).	28,000,000
Transmission and distribution losses	1,750,000
Connected total load	77,000,000

As described in Part 1, the steam is taken from the back pressure turbines in the power station across the Thames River and passed through a steam to water heat exchanger. The exhaust heat output of each turbine unit at full load is 22,700,000 Btu per hr. Two turbine units are sufficient even on cold days, as the load can be balanced by the accumulator and, if necessary, steam can be taken from the turbines for the full 24 hours. Also, if required, steam at a higher pressure can be taken from the turbines at an earlier stage and added, through a reducing valve.

From the accumulator, which can store 400,000,000 Btu, the hot water is distributed to the various buildings by underground supply and return lines. The circulating pumps are each designed for 46,000 gallons per hr, at 32 ft head, and can work singly or in parallel.

Each building is heated by radiators; the outside temperature controlling the temperature of the circulating water by a thermostatic valve. Although the heating water from the accumulator is delivered to the individual buildings at a higher temperature than is required for the building's heating system, by mixing the return water from the radiator circuit with the supply hot water, the correct and most economical temperature, as controlled by the thermostatic valve is obtained and circulated within the buildings. This system, employing the use of injectors at each building, eliminates the use of heat exchangers for the space heating, which are only installed for the domestic hot water.

Summary

To summarize the general remarks and comments of engineers who have had experience of both high temperature water and steam, the general consensus of opinion is:

(1) Any new project with a total heat load of from 5 to 10 million Btu per hr should be carefully examined to determine the advantages and savings of high temperature water according to the ratio of space heating to process requirements.

(2) New projects over 10 million Btu per hr, of which the space heating load is at least 50% of the total, should invariably be designed for high temperature water.

(3) Where existing boiler plant or old pipe lines are being replaced or extensions to existing systems are contemplated, a survey should be made and a careful study prepared showing (a) capital costs and (b) operating and maintenance costs of both steam and hot water, with advantages and disadvantages. The cost of such a survey would not be excessive, but it should give a complete and comprehensive picture of the proposed work. It should be remembered that the internal distribution lines within existing buildings, the type of heating and existing equipment need not be changed regardless of the system which has been in use. Where process steam is at present required or additional steam necessary, high temperature water can be utilized to generate this steam through heat exchangers.

Acknowledgements are given to Mr. Bertram Baden of Matthew Hall & Co. Ltd., Arthur Heaton & Co. Ltd., The Princess Press Ltd., London, A. E. Margolis Dipl. Ing. of Kennedy and Donkin, Mr. Lorne Wiggs, of Wiggs, Walford, Frost & Lindsay, consulting engineers, Montreal, and others who have supplied background and illustrative material.

TABLE 5. FLOW OF WATER AT 300 DEG F IN SCHEDULE 40 PIPE

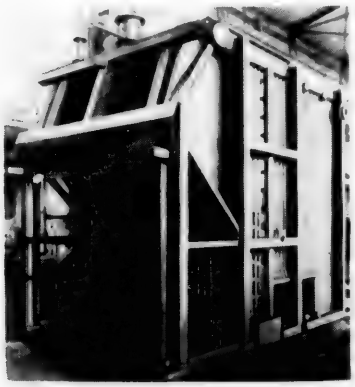
[1]Velocity, fps	Friction loss, in. per ft.	Nominal pipe diameter, inches: ⅜	½	¾	1	1¼	1½	2	2½	3	3½
		Flow of water, pounds per hour									
	.02	92	158	355	705	1,395	2,250	4,430	7,120	12,550	16,040
0.5	.03	114	197	450	912	1,740	2,880	5,450	8,700	15,460	21,260
	.04	134	236	525	1,060	2,080	3,350	6,360	10,100	17,880	25,950
	.05	150	275	590	1,190	2,400	3,760	7,210	11,400	20,120	30,125
	.06	166	310	650	1,320	2,670	4,170	7,960	12,500	22,100	33,080
	.07	180	342	708	1,430	2,890	4,550	8,630	13,730	24,100	35,700
1.0	.08	195	375	762	1,525	3,100	4,850	9,300	14,720	26,100	38,350
	.09	208	406	820	1,625	3,290	5,160	9,900	15,920	27,750	40,350
	.10	220	422	875	1,710	3,480	5,475	10,500	17,100	29,300	43,200
	.12	244	466	946	1,880	3,810	6,020	11,500	18,200	31,800	47,600
	.14	262	506	1,048	2,035	4,140	6,520	12,500	20,000	34,450	51,450
	.16	284	546	1,140	2,180	4,415	7,000	13,400	21,520	37,100	54,700
	.18	305	581	1,228	2,320	4,680	7,450	14,280	22,820	39,750	59,000
	.20	326	612	1,300	2,460	4,960	7,900	15,110	24,030	42,400	62,750
	.22	343	656	1,390	2,610	5,270	8,300	16,080	25,510	44,800	66,750
	.25	360	695	1,470	2,760	5,580	8,760	17,000	27,000	47,690	70,890
	.27	376	732	1,540	2,920	5,750	9,190	18,000	28,400	50,000	74,500
2.0	.30	398	768	1,610	3,065	6,050	9,700	18,820	29,800	52,200	77,700
	.33	415	806	1,650	3,240	6,340	10,220	19,800	31,300	54,300	81,750
	.36	435	848	1,770	3,410	6,550	10,700	20,680	32,700	57,250	86,000
	.40	460	898	1,860	3,610	7,000	11,300	21,800	34,330	60,500	92,150
	.45	487	958	1,980	3,810	7,500	11,930	23,180	36,280	64,250	98,200
	.50	515	1,012	2,100	4,030	8,000	12,620	24,500	38,400	68,000	101,200
	.55	543	1,065	2,208	4,260	8,500	13,300	25,920	40,400	71,500	104,200
	.60	570	1,118	2,300	4,460	8,950	13,950	27,150	42,400	74,800	
	.65	595	1,168	2,400	4,640	9,350	14,620	28,300	44,250	78,200	
	.70	618	1,214	2,500	4,830	9,740	15,250	29,500	46,100		
3.0	.80	663	1,300	2,690	5,160	10,550	16,330	31,650	49,150		
	.90	705	1,380	2,850	5,445	11,340	17,350	33,670			
	1.00	750	1,460	3,200	5,730	12,040	18,600	35,400			
	1.20	823	1,610	3,330	6,300	13,200	20,300				
	1.40	890	1,750	3,625	6,860	14,270	22,000				
4.0	1.60	955	1,875	3,880	7,430	15,100	23,550				
	1.80	1,015	2,000	4,100	7,850	16,100					
	2.00	1,072	2,120	4,360	8,300						
	2.30	1,154	2,275	4,680	8,960						
5.0	2.60	1,230	2,420	4,990							
	3.00	1,328	2,610	5,375							
6.0	3.50	1,442	2,840	5,750							
	4.00	1,542	3,046	6,200							
7.0	5.00	1,745	3,420								

(Velocity, 8.0 fps)

[1]Velocity, fps	Friction loss in. per ft.	Nominal pipe diameter, inches: 4	5	6	8	10	12	14	16
		Flow of water, pounds per hour							
	.02	25,400	47,100	81,000	162,000	300,000	460,500	580,000	1,210,000
2.0	.03	33,000	59,400	99,700	205,000	367,500	582,000	746,000	1,443,000
	.04	38,400	69,000	115,300	238,000	430,000	682,000	873,000	1,670,000
	.05	43,250	77,800	129,800	268,900	485,000	776,000	988,000	1,920,000
	.06	47,750	86,000	143,500	296,800	533,000	855,000	1,085,000	2,084,000
3.0	.07	51,800	93,220	156,200	322,800	582,000	925,000	1,180,000	2,245,000
	.08	55,500	100,400	167,300	345,000	629,000	978,000	1,261,000	2,380,000
	.09	59,300	107,500	178,000	366,500	670,000	1,100,000	1,345,000	
	.10	63,000	113,700	187,800	388,800	710,000	1,123,000	1,427,000	
4.0	.12	68,500	125,200	207,100	428,600	780,000	1,229,000		
	.14	75,150	136,200	227,900	466,200	848,000			
	.16	81,000	146,000	241,700	502,100				
5.0	.18	86,000	155,700	255,500	538,000				
	.20	91,400	165,250	269,300					
	.22	97,000	176,000	290,000					
	.25	102,300	186,200	310,800					
6.0	.27	107,800	193,000						
	.30	113,000	200,900						
	.33	118,600	215,100						
7.0	.36	124,000							
8.0	.40	131,200							

(Velocity, 8.0 fps)

[1]Velocity brackets follow diagonally stepped lines and middle values are those read from friction chart. Brackets are suggested modules for pipe sizing.



Tube assembly of a German HTW boiler installed in the Kodak plant in Stuttgart. This type is now under license to Babcock & Wilcox for manufacture in the U. S.

Table 5 should be used only as a guide or check against standard formulas. The velocities given relate to the middle figures and will therefore be lower or higher nearer the dividing lines. For instance, 656 pounds of water passing through a ½-inch diameter pipe will result in a loss of approximately 0.22 inch per foot with a velocity of 22 inches per second.

Example: To ascertain the size of pipe for 25,000,000 Btu per hr with a temperature design drop of 100 deg F,

$$\frac{25{,}000{,}000}{100} = 250{,}000 \text{ lbs of water per hour.}$$

In Table 5 (or Fig. 19), the choice is between an 8-inch pipe with friction loss of about .05 inch per ft and velocity of 3.5 fps or a 6-inch pipe with friction loss of 0.18 inch per ft and velocity of 6.0 fps.

Applied Solar Energy

Abstracts of papers presented at the World Symposium on Applied Solar Energy in Phoenix, November 1 to 5, are concluded in this second installment covering heating and cooling, solar water heaters, and other uses of solar energy.

DOMESTIC hot air heating with overlapped-plate solar collectors was discussed in a paper by George O. C. Löf, consulting engineer, Denver, Colorado. Although the basic principle of the overlapped-plate solar heat collector is the same as that of the continuous flat plate overlaid by one or more glass sheets, said Mr. Löf, there are significant differences in design and operation. In addition to their role as insulation against heat loss, the overlapped-plates serve as the actual radiation absorbers and heat exchange surfaces. A second distinction is in the use of low air flow rates which result in good heat recovery at high temperatures. The design is believed to have economic advantage in being subject to factory production techniques.

The overlapped-plate collector consists of a rectangular housing with a clear glass cover plate. Arranged in banks below the cover plate are overlapping glass slats with air spaces between them and with the overlapped portions covered with a black coating. The glass slats form a staggered louver through which air is passed. The black portions of the louvers pick up solar energy which is transferred to the moving air. Air is exhausted from the enclosure to a bed of uniformly sized gravel for storage of heat. The gravel functions both as a storage medium and as a heat exchanger for a warm air system used in combination with an auxiliary heater.

First use of this type of collector and storage unit was in a small bungalow in Boulder, Colorado. A collector of 463 sq ft was constructed on a portion of the roof sloping 27 degrees to the south. A heat storage bin of 6½ cubic yard volume containing 9 tons of ¾-in. gravel was installed in the basement, and these units were coupled with an existing gas fired hot air heating system. There was a fuel saving of about 50% in the heating season, in comparison with fuel consumption of years prior to installation of the collector.

The most important result was development of a solar and fuel heating system, the principal components of which could be factory made and which could be designed into a conventional style house without detracting from appearance or usefulness of the dwelling.

When the Boulder house required heat and the solar collector was supplying hot air, dampers automatically directed the solar heated air to the rooms of the house and then back to the collector for reheating. At night, and during cloudy periods, air from the house return ducts passed through the heated storage bed and was forced by the blower through the regular furnace to the rooms. When thermostats in the collector and storage bed indicated insufficient temperatures at those points, dampers would shift and the gas fires would automatically operate in conventional manner.

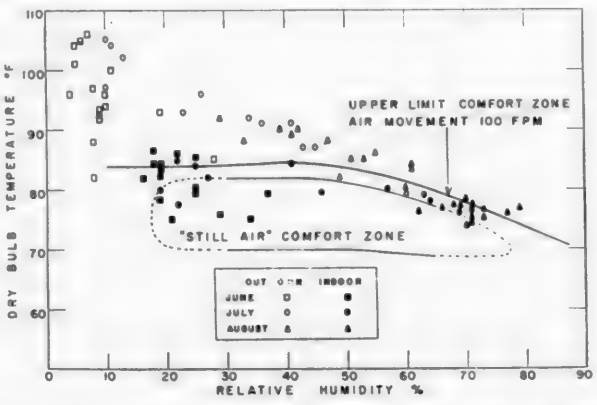
Based on experience in the Boulder house, a system for a house to be located in Denver was designed with refinements and improvements. Cost of the equipment for the Denver house was determined by estimates on all material and labor including auxiliary control items. The total investment was amortized at a rate of 5% per year. Total fuel and electricity costs were then added to the annual fixed costs, and the grand totals for each collector area were compared with each other and with a conventional system. Total annual cost was found to be very insensitive to collector size because the increase in fixed cost with collector enlargement is almost exactly equal to the decrease in auxiliary fuel expense. For example, a system using a 200 square foot collector showed a total annual cost of $182, while a 500 square foot collector showed a total annual cost of $181. Annual costs for a conventional system, on the same basis would be $159.

A modification of the Denver house, redesigned to include solar air conditioning, is scheduled for construction early in 1956.

A Fully Solar Heated House

A space heating and cooling installation. entirely heated by solar energy and cooled by night radiation from an air cooling device was described by Raymond W. Bliss Jr., partner in Donovan and Bliss, consulting engineers of Amado, Arizona. The installation was attached to an existing house referred to as Desert Grassland Station, a rather delapidated dwelling belonging to the U. S. Forest Service. The house is located at an elevation of 3800 ft about thirty miles south of Tucson, Arizona. The average January temperature in the area is 48 deg F. The system was described fully in AIR CONDITIONING, HEATING AND VENTILATING for October, 1955.

Although heat collection and storage are about as efficient and economical as any yet developed. the author doubts if a copy of the system would be economically attractive even if installed in a house properly designed for it. The installation was built as a stepping stone toward design of a complete solar air conditioning system capable of high quality performance the year round. It was also intended as a demonstration that the properly designed solar heating system will function nearly as calculated.



Outdoor and indoor maximum temperatures at Desert Grasslands Station with night radiation cooling in operation during 1955 midsummer season.

The heat collector is a flat non-focusing type utilizing several layers of black screens to absorb incident sunshine and transfer the resulting heat to the circulating air. The collector owes its efficiency primarily to the large total area of screen filaments and to the fact that circulating air keeps the filaments at a temperature only moderately higher than that of the circulating air, thus keeping radiation loss at a minimum. The collector is tilted to face the mid-day sun squarely on January 15 and is faced with ordinary single strength window glass. Under average winter conditions on a clear day the collector puts into storage about 1000 Btu per square foot per day and is sized to collect roughly twice the average 24 hour daily heat requirement in a single day.

The storage unit is a bin of 1300 cubic feet, about 65 tons of 4-in. diameter field rock. Storage capacity is estimated at 27,000 Btu per deg. The average rock pile temperature is about 120 deg F and fluctuates between 90 and 140 deg.

Operation of the system is automatic. When the collector is operating, air flows through the storage bin in an upward direction. When the bin is delivering heat, the air flow is in the reverse direction. Solar heat collection is controlled by an outdoor sunshine responsive thermostat; house heating by a conventional indoor wall thermostat. When the house requires heat during a period of collection, the collector air is diverted directly to the house. In tests under severe conditions, the house was held to proper temperature at all times and no auxiliary heating was required. Winter heating performance is judged to be equivalent to any conventional high quality forced warm air heating system.

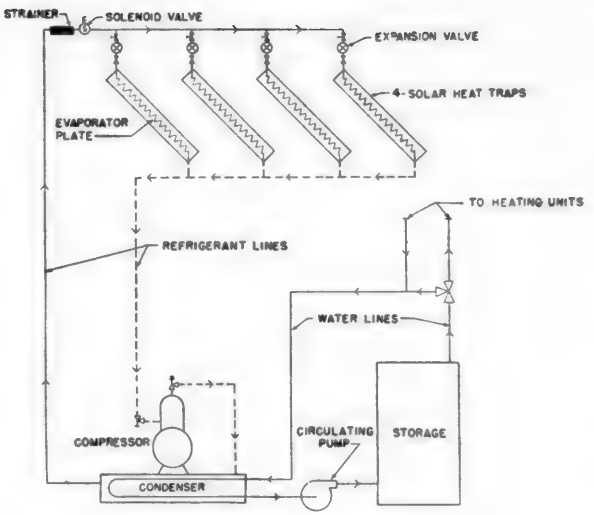
For summer cooling, slightly undercooled air is forced through the storage bin, and cooled air is circulated from the storage bin to the house on demand. The undercooling night radiator is simply a large horizontal porous screen exposed so that it loses heat by net radiation exchange with the night sky. Air is drawn through the face screen, and under cooling averages about 2 deg F on clear nights. A similar arrangement for cooling water by radiation to the night sky is under study by Donovan and Bliss.

Operating cost of the system including cost of fan operation is estimated at about $12 for the season, as compared with cost of about $80 for operating a comparable conventional system.

Solar Collector Heat Pump

Design and performance of a solar collector heat pump were described in a paper by E. R. Ambrose and Philip Sporn of American Gas and Electric Service Corp., New York. Some of the present handicaps facing the direct utilization of solar energy with heat collectors can be overcome by incorporating a heat pump into the system. One advantage is the ability of the heat pump to maintain a relatively low collector temperature. This reduces the transmission losses and thereby increases collector efficiency. At the same time a larger percentage of the lower intensity solar energy can be collected during early morning and late afternoon hours, and on cloudy days.

For a series of tests over the past five years, solar collectors were mounted on the roof of a one-story brick building near New Haven, West Virginia. The location is an industrial area at roughly 39 degrees north latitude and elevation of 600 feet above sea level. The collector



Flow diagram for solar heat pump system shown as it would be operating on the winter cycle.

consists of a number of parallel refrigerant circuits arranged in 16 gage steel plates to form four collecting surfaces 4 feet by 7 feet each. These plates form the evaporator of a refrigerant circuit and were arranged to face south at an angle of 50 degrees from the horizontal. The operating cycle is identical to the conventional refrigeration cycle. The evaporator operates at about 60 deg F or lower, and the condenser, which is used to heat a water storage system, is usually about 110 deg F or higher. A 5 hp motor operated the Freon F-12 compressor. At various times, the solar trap with the evaporator plates as backing were operated with two glass covers, with one glass cover, and finally with no glass cover.

The maximum heat recovery rate at a compressor speed of 620 rpm was 224 Btu per (hour) (square foot). On a comparable day with a compressor speed of 440 rpm, the recovery rate was 179 Btu per (hour) (square foot). On some earlier tests, with compressor speeds of 835 rpm, the heat recovery rates range from 250 to 360 Btu per (hour) (square foot) for similar operating conditions. While the amount of heat recovered increased with compressor speed, there was a lower coefficient of performance at higher speeds. It appeared that the heat recovery rate was not seriously affected by the removal of the glass covers.

Quite frequently the outdoor temperature was considerably above the solar collector temperature, which allows the air as well as the solar and sky radiation to serve as the heat source. This would explain why the solar trap recovery rate in some instances exceeded the available solar energy as measured by the pyrheliometer.

Improvement in coefficient of performance was noted as the size of the collector was increased, or the speed of the compressor decreased, or the suction temperature increased to approach the condensing temperature. A coefficient of performance of from 6 to 8 was obtained when operating at about 60 deg F suction temperature and 90 to 112 deg F condensing temperature. Suction and condensing temperatures of this magnitude are feasible at the present time on cloudless days. It is questionable however if a practical competitive system could be designed unless outdoor air could also be employed as a

supplemental heat source for winter as well as a heat sink for summer cooling.

The same surface used as a heat source for winter heating can be quite easily adapted to serve as a heat sink for summer cooling. With the collector plate free of glass covers or enclosure of any kind mounted on a south facing vertical wall, the rain, wind, solar and sky radiation, and the outdoor air can all be made to serve as a heat source and heat sink. The same collector-heat pump unit combination can also be used for heating domestic water.

Smaller storage systems are required with solar heat pump installations. Water can be stored during the heating cycle at relatively high temperatures so that it can be directly used to heat the space. Another possibility is to store solar energy at lower levels, say 50 to 60 deg F, to serve as the heat source for the heat pump. While a certain amount of storage is necessary, storage in excess of a one day supply may be difficult to justify in a solar heat pump when outdoor air is used as a supplement heat source.

It is noted that 90, 80, and 70% of the design heating capacity will equal or exceed the building requirements 99, 98, and 96% respectively of the heating season. Hence, use of large expensive equipment merely to satisfy the maximum heat requirements, which occur at relatively short periods of time, cannot be justified. This is another reason why storage may ultimately play an important part in obtaining a practical solar heat pump system.

High Temperature Furnaces

The sun's energy, though greatly dispersed by distance, is not degraded; so that a proper condensation of the solar radiation by optical means may bring about very high temperatures approaching but never reaching the temperature of the sun—about 6000 degrees K. Felix Trombe, research director of the National Center of Scientific Research and director of the Solar Energy Laboratory at Montlouis, France, described existing solar furnaces using reflection as a means of convergence. Some solar furnaces comprise a single converging reflecting surface which must be constantly oriented toward the sun. Such machines cannot very well reach large dimensions.

Five-foot solar furnace made from searchlight reflector now used by Convair for high temperature research.

The largest one, at Bouzareah, Algeria, is 8.4 meters in diameter (about 24 feet). It is more convenient to use movable plane reflectors where work at a fixed hearth is simplified and large scale machines are easier and less expensive to build.

Plane reflectors may be either polished metal or mirror surfaced glass. Those favored at the French laboratory are small units of plane mirror of commercial quality about 20 inches square. These reflecting elements are permanently strained to the approximate curvature of a parabola. They are arranged individually in a movable bank which is oriented to reflect the sun's rays into the focusing paraboloid of the furnace which contains the fixed hearth. The permanent strain not only overcome certain geometric disadvantages of a reflecting plane surface, but also imparts rigidity to the assembly against the effects of wind. The main advantage of the strained position is in efficiency of collection, 3500 curved and oriented mirrors being the equivalent of over 20,000 oriented flat mirrors. Orientation of the reflecting elements is accomplished by a pressurized oil hydraulic system actuated by photoelectric cells.

Concerning the future of solar furnaces, it was pointed out that already solar furnaces are no more expensive today than electric hearth furnaces of the same power. Research is continuing to further reduce the costs of solar machines, and it is likely that cost advantages together with process advantages of solar furnaces will increase the popularity of this type of instrument.

Solar Stills

In the United States, the Saline Water Conservation Program has been created within the Department of the Interior with the objective of developing economically feasible processes for converting saline water into fresh water. The use of solar energy for this purpose is within the interest and range of this program, and Dr. Maria Telkes of New York University described current developments in solar stills and possibilities for future development.

Although the largest solar still in the world was built in 1872 in Chile and covered 51,000 square feet to produce of maximum yield with 6000 gallons per day, cost estimates of the government project indicate that none of the devices now in prospect can produce water at a cost lower than $3.25 per thousand gallons. The economic goal of the project is to produce municipal water at 38 cents per thousand gallons and irrigation water at 12 cents per thousand gallons. Simple, direct solar heated evaporating trays with self contained condensers but without arrangements for energy concentration can produce water at about $1.65 per thousand gallons.

A small still comprising a black, porous pad supported beneath a tilted glass face was described. Sea water is fed through a channel at the top of the porous pad, evaporated during its journey down the pad, and discharged at the bottom as concentrated brine while the condensed vapor is collected from the under surface of the glass and discharged through a fresh water outlet pipe. Cost of water from such a still was estimated at 82 cents per thousand gallons. The probable cost of water obtainable by solar stills, said Dr. Telkes, is at the present time already lower than the cost of water transported over long

Low temperature solar engine uses vapor of volatile liquid in flat collector to actuate model irrigation pump.

distances or obtained by fuel operated stills in tropical regions.

Mechanical Energy from Solar Energy

For more than a century numerous inventors have developed a variety of solar powered devices described by Richard C. Jordan and Warren E. Ibele of the University of Minnesota. No fully developed system has to date shown economical feasibility. Further technological advances and the depletion of current prime energy sources may readily change this picture. Technical limitations on the conversion of solar energy to mechanical power include the maximum theoretical efficiency which can be obtained by a heat engine, the degree to which a practical heat engine can approach this limit, and the temperatures which construction materials can withstand without failure. While developments now in prospect are not likely to increase the efficiency of present conversion methods sharply, it may well be that simplicity and ease of operation and maintenance will be much more important than high efficiency in solar conversion systems. A system of comparatively low efficiency but simple mechanical operation and reliability coupled with simple maintenance and not too great a bulk would have immediate use in arid sections of the world. It appears that in the immediate future solar mechanical power will be most practical for small power systems in remote areas and where intermittent operation is not a deterent.

Cooling with Solar Energy

One of the most intriguing potential applications of solar energy is in air conditioning or comfort cooling, said George O. G. Löf, consulting engineer of Denver, Colorado. Primarily because of formidable technical and economic problems, practical solar coolers have not been developed, and only recently have a few experimental investigations been undertaken.

An attractive feature of space cooling with solar energy is the availability of maximum solar radiation when cooling is most needed. Two feasible systems for direct cooling by means of solar energy are absorption refrigeration and absorption dehumidification. Both of these have been experimentally investigated.

An absorption apparatus modified from a conventional fuel operated air conditioner manufactured in this country, was not satisfactory because of high temperature requirements in the solar collector for this unit. A new design using solar heated water or air offers a more promising development. An absorption dehumidifier using solar heated air for use in comparatively humid areas has shown good performance, and it is expected that a semi commercial unit will be built and operated in the near future.

It can be readily shown that, unless a solar unit is also used for winter heating, solar comfort cooling cannot be competitive with conventional compression refrigeration cooling in the United States. A unit providing solar dehumidification cooling with winter solar heating supplemented by some auxiliary fuel appears, in preliminary estimates, to have even lower cost than a commercial all year fuel operated heating and cooling systems. A system using sub-cooled night air directly in a thermal storage unit for space cooling on the following day has been described. Another cooling system uses the storage facilities in combination with a small compression refrigerator operating nearly continuously during the warmest months. This arrangement reduces the necessary size of the refrigeration unit to about $\frac{1}{3}$ the normal period.

Steam has been supplied from a large parabolic solar reflector for the experimental operation of a one half ton absorption refrigeration ice making machine in Russia. Energy and construction cost factors make such applications for domestic or commercial refrigeration in the United States unattractive.

A very simple intermittent absorption refrigerator previously manufactured in the United States shows better promise, and work is proceeding toward improvement of the unit.

An experimental program at the University of Wisconsin is directed toward the development of simple, low cost, solar operated refrigerator units suitable for food preservation in hot nonindustrialized countries.

The status of solar cooling and refrigeration can be summarized by declaring that very little attention has been given to developing these ideas, no commercial systems are in existence, only certain components of two space cooling units have been experimentally built and tested, and only one experimental ice making unit has been operated. Limited development work is proceeding along several lines, but much more effort can well be placed in these areas.

Performance of a solar operated absorption refrigeration air conditioner depends on the efficiency of converting solar radiation to sensible heat at the temperature required for operating the refrigerating generator. The present practical minimum temperature for absorption air conditioner operation is about 180 deg F. A conventional water heating flat plate collector overlaid by two or three glass surfaces can deliver water at about 210 deg to the

heating jacket of the generator. The collector would be operating at an average temperature about 120 degrees above that of the atmosphere on a hot day. Net heat delivery, with return water to the collector at 200 deg, would be about 900 Btu per square foot of solar collector area, corresponding to 40% collection efficiency on a sunny summer day in central U. S. This heat delivery would result in a cooling effect of approximately 450 Btu per square foot of solar collector. With a roof collector of 600 square feet. the average daytime removal capacity of the system would be about 30,000 Btu per hour, equivalent to 2½ tons of refrigeration. If the operating temperature requirement of the refrigerant generator could be reduced. efficiency would rise. A 30 deg decrease would increase the refrigeration capacity 10 to 15% with the same collector.

Another possible design for a collector is the overlapped plate collector. Experimental units of this design have shown satisfactory efficiencies in heating air from room temperature to more than 200 deg.

By using the circulating air and two or three cover plates rather than the single cover plate used for winter operation of the overlapping plate collector, air temperatures as high as 300 deg have been obtained and an average temperature throughout the 6 to 8 hour operating day may lie between 250 deg and 275 deg. With ideal construction and insulation, a 600 square foot collector should deliver about 2 tons of refrigeration over a daytime average. At mid-day the effective capacity of this system would be slightly over 4 tons of refrigeration. Present absorption refrigerators which can use temperatures as low as 175 deg F in the refrigerant generator may enable the use of lower collector temperatures and hence higher collector efficiencies. The possibility of further temperature reduction by use of other refrigerants also exists. Limited data on methanol and lithium bromide systems show promise along this line.

A third and yet untried method of supplying heat to the refrigerant generator is the use of the solar collector itself as the refrigerant generator. Calculations indicate that if a collector generator could be built, after solving problems in wide-area leak-proof construction, a 600 square foot solar collector in the southern part of the United States should have a maximum cooling capacity of over 5 tons of refrigeration and a daytime average of about 3 tons.

A fourth medium that shows possibilities could be the collection of heat from a solar collector to a refrigerant generator as low pressure steam.

A solar dehumidification system using solar heated air and an experimental glycol stripping unit provided a net daily cooling or hedumidification effect of 600 Btu per square foot of collector. This is equivalent to a net overall solar utilization of about 25%, and the average cooling capacity of a 600 square foot collector would be about 50,000 Btu per hour or 4 tons of refrigeration.

Solar Water Heaters

A review of the present status of solar heaters for domestic hot water was presented by Roger N. Morse, engineering section of the Commonwealth Scientific and Industrial Research Organization in Australia. Water temperatures on the order of 135 deg F and quantities of about 50 U. S. gallons per day were determined as the requirements of an average household.

Simplicity of the flat non-focusing absorber makes it the obvious choice for solar water heating, said Mr. Morse. Most of the literature on solar water heaters comes from the United States, and some details have been given of work on water heaters being undertaken in France, India and Russia and French West Africa as well as the United Kingdom and Israel.

The flat plate absorber consists of a blackened plate covered with one or more sheets of glass to reduce radiation and convection losses, and with insulation on the underside to reduce conduction losses. The whole assembly is enclosed to make it weatherproof and oriented so that it is normal to the sun's rays at noon for a particular time of the year. Chief losses are reflection from the glass surface, radiation and convection resulting from temperature of the absorber, and conduction through insulation on the underside.

Mr. Morse reviewed mathematical approaches to collector design and described experiments in Melbourne using a double glazed unit with a net area of 16.1 square feet. With constant water flow of about 3 lbs per (hour) (square foot of absorber), a temperature rise of about 60 deg F was obtained during periods of maximum insolation.

Area of the absorber is restricted by economic considerations. Since efficiency of the absorber is governed by the flow and is independent of the rate of incident radiation, hydraulic resistance should be as low as possible. A satisfactory arrangement was found to be one in which a header along the top of the absorber is connected to a header at the bottom by a number of smaller flow pipes which are thermally bonded to a flat collector sheet with overall dimensions of 6 feet by 4 feet.

For domestic or small industrial units, gravity flow through the system is a logical selection, and sizing compromise for the connecting piping should give a flow allowing a 20 deg rise through the absorber for an energy intake of 200 Btu per hour square foot. The flow rate in pounds per hour has been set as numerically equal to ten times the collector area. Conventional methods are used to calculate friction head and available thermal head.

The storage tank should contain one and a half to two days supply. The flow pipe from the absorber should enter the tank at a point somewhat lower than its top. This prevents undesirable mixing in the tank during operation.

For larger installations there are advantages in using forced circulation with a pump controlled either thermostatically or by radiation. This allows the tank to be placed lower than the absorber.

Energy Conversion

Experiments at Massachusetts Institute of Technology on the chemical utilization of light were described by Lawrence J. Heidt of the Department of Chemistry. Sunlight is employed in these experiments mainly for confirmatory work when the maximum amount of desired photochemical reaction has been established in the laboratory under mercury vapor lamps. Experiments using photoactivated blue dyes, like methylene blue, showed that when electrodes are placed in the light and dark portions of a solution, a small potential and current develops be-

tween the electrodes. Weakness of the current and deterioration of the dye caused this work to be discontinued. Several years of work on carbohydrate substances seemed to show that these substances are not well suited for the storage of solar energy by chemical means when the goal is the production of power.

Need for better, simpler, and more reliable tools for use by the photochemist has diverted some of the research effort to development of such tools which include light sources, light measuring instruments, and methods for measuring small changes in concentration.

The discovery that water can be catalytically decomposed by light into its elements hydrogen and oxygen, and that thereby solar energy can be converted into chemical energy in storage for the production of power was made about three years ago by using a solution of water, cerous and ceric perchlorates, and perchloric acid. This reaction kindled a great deal of optimism which had to give way to grave doubt when the hoped for results were not easily realized for several reasons. First, the efficiency of the conversion is very low. Second, the process is brought about by only extreme ultra violet portions of sunlight which pass through good quartz but not through ordinary glass. Third, the process is greatly inhibited by small contaminations and will not proceed when the water has not been carefully purified.

Electricity from the Sun

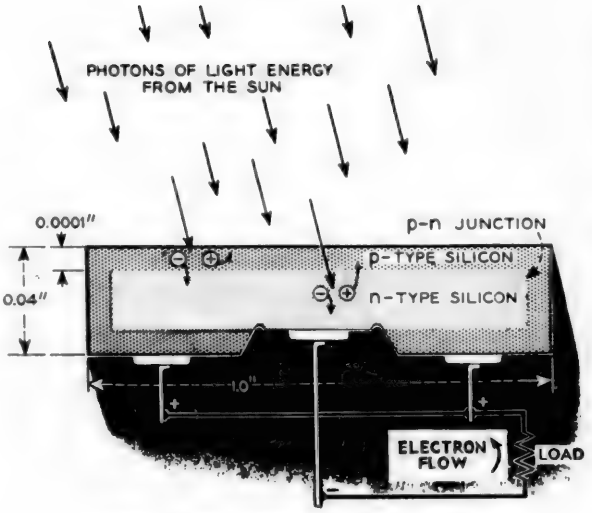
The widely publicized solar battery produced by the Bell Telephone Laboratories was described in a paper by G. L. Pearson. A review of prior electrical conversion devices cited the thermopile, the photogalvanic cell and the photovoltaic cell. All of these devices were developed in the 19th century, the most recent being the photovoltaic cell developed around 1876 using selenium as the light sensitive material. All of these devices operate at efficiencies of 1% or less.

In 1954 workers at the Bell Telephone Laboratories succeeded in raising the efficiency of the photovoltaic cell to 6% through the use of silicon prepared in a special manner. Since that time improvements have raised the efficiency to 11%.

Heart of the new silicon solar cell is the p-n (positive-negative) junction formed near the front surface of a plate of silicon. One portion of the plate is made positively conducting by adding trace amounts of an element higher in the periodic table. The other portion of the plate is made negatively conducting by adding trace amounts of an element, such as boron or galium, from a lower order of the periodic table. When light falls on the p-n junction, electrons flow causing a current.

The first field application of the solar battery is its use as a primary power source for amplifiers in a rural telephone circuit in Georgia. An array of silicon cells, 432 in all and capable of furnishing 9 watts of electrical power in bright sunlight, is mounted at the top of a telephone pole. The battery serves as a trickle charger for a 22 volt nickel-cadmium storage battery mounted near the base of the pole. The storage battery powers an all-transistor carrier amplifier.

Another communications application has been use of the solar battery to power a portable FM transistor radio transmitter. Potential range could be extended to several miles.



Schematic cross section of solar battery cell.

Dr. Pearson emphasized that the solar battery is an experimental device and too expensive to compete with conventional power generators.

USSR Developments

The status of solar energy conversion in the Soviet Union was described by Professor V. A. Baum, head of the Heliotechnical Laboratory of the USSR Academy of Sciences. Solar water heaters of the flat collector type have been well developed and standard blueprints for various capacities are available. The collector is a sheet of black painted aluminum idented for half-inch pipes through which water circulates by gravity flow. The lower part of the collector is covered by one sheet of glass and the upper part by two sheets.

Hotbeds for growing vegetables were also developed in which excess daytime heat is vented to simple ground storage bins for night use.

For higher temperatures and steam generation, focussing arrangements using parabolocylindrical and paraboloidal reflectors have been used. A solar cooker using a non-accurate parabolic mirror was designed in 1951 and is equivalent to a 500-watt electric stove.

A solar boiler uses a parabolocylindrical aluminum mirror to boil water in a pipe set at the focal line. A 20-ft pipe with mirror 6 ft wide and without coverglass will generate about "400 to 500 liters of boiling water" a day. Steam can be generated up to about 12 atm. pressure.

A 32-ft paraboloid mirror boiler generates about 100 lb steam per hour at 7 atm. pressure.

An absorption refrigerator operated by a solar boiler produces 500 lb of ice a day.

House heating in USSR by flat collectors is considered impracticable because of cloudy winters. Focussing heaters with high temperature storage of water would be more feasible for big blocks of buildings with a central heating system. It was calculated that a solar plant for a certain city of 17,000 inhabitants (Ashkhabad) would require 12.26 sq ft of collecting surface and 282.4 cubic feet of heat storage space per person.

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Water Supply for Construction Projects

AN adequate water supply is an important need for every construction project for it is required by each of the contractors and serves many purposes. In addition to serving various phases of the work, it is also required for drinking. Therefore, the water supply should be of the highest quality to meet health standards and it should be in abundant supply to serve the demands of the project. The temporary water piping used should be clean and carefully maintained to assure proper supply and avoidance of contamination dangers.

Responsibility for Installing Water Supply

Unless the responsibility for furnishing the water supply is included in the specifications, to be a part of the plumbing contractors' work, it must be handled by others. Often, this work is included in the general contractors specification. However, he will usually sub-contract it to the plumbing contractor. In any event, the water supply piping and necessary waste system must be properly installed and maintained during the course of the construction project to assure clean and adequate water.

Although the water supply is but a relatively small consideration in any construction project, it nevertheless should be fully covered when the specifications are prepared. This means that the engineer's specifications should contain a paragraph that informs the plumbing contractor that the plumber is to furnish and maintain the proper system.

If this work is to be contained in the architect's specifications, then the engineer should check with the architect to be sure that this phase of the work is sufficiently covered in his specifications. In this way, the engineer is sure that the water supply system is installed in a manner befitting the requirements of a large-scale project.

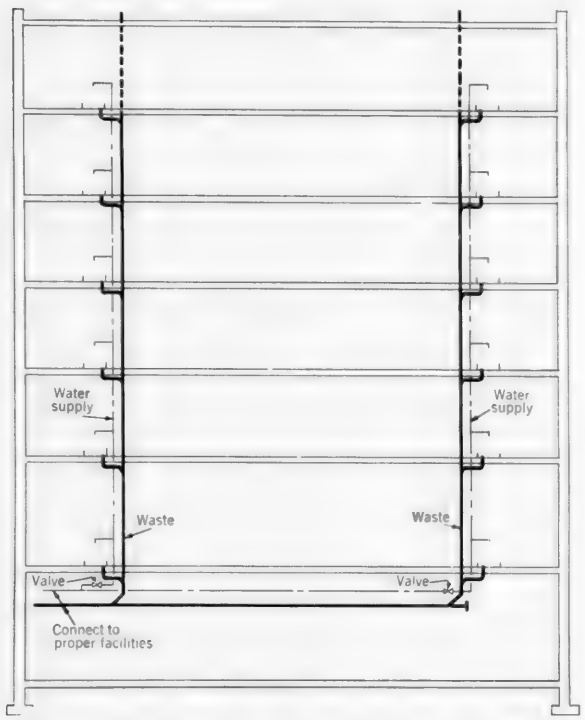


Fig. 1. Water supply and waste for a typical project.

Misuse of Other Piping Systems

Fortunately, most plumbing contractors will provide an appropriate water supply system even though the scope of work may not be fully covered in the specifications. Unfortunately, however, every now and then when the work is not adequately covered in the specifications, an attempt is made to economize. Then instead of furnishing a separate water system, other piping systems are utilized to accomplish the purpose.

A fire standpipe line is always required in every construction project, with hose stations on each floor of the building. While it would seem perfectly feasible to utilize this line for the water supply in addition to its function for fire protection purposes, this is a dangerous practice for two important reasons:

1. A fire standpipe is intended for fire protection only and should not be used for any other purpose. Once this line is tapped for water supply, its usefulness is destroyed in the event of a fire. Should there be a fire outbreak, all the available water pressure is needed to fight the fire. If the line is being used to furnish water for the construction needs at the various building floors, sufficient pressure will not be available to fight the fire. Besides, in the case of fire, there is not enough time to shut off the supply at each floor to ensure adequate water.

2. The piping specified for this system is usually of black steel or similar material. While this type material is suitable for this purpose, it is not recommended for supplying running water during the course of construction. Running water in this line will cause rapid corrosion of the piping interior and in addition, will cause tuberculation. Tubercles reduce the effective open area of the piping and the increase of friction on the inner lining of the piping due to the corrosion.

A fire standpipe system is an important asset in a completed building and should not have its capacity reduced or its interior encrusted with friction-producing

tubercles, just because this line was selected to fulfill the construction needs of the project. If a proper water supply line is installed, this misuse of the fire line will not occur.

Offhand, another piping system that would appear likely for the water supply needs is the gas line. This is a convenient pipe line because it is installed as a vertical riser with a gas connection at each floor. By placing a valve at each connection, it could also deliver water.

However, here again black steel pipe is usually specified as it is not intended for water supply use. When this line is used for running water, tubercles and rust will quickly form.

The result of this misuse is that when the gas line is finally placed in service, its effective open area will be greatly reduced. Friction caused by the rust and tubercles will reduce the gas flow rate. This, too, could have an effect on the amount of gas that reaches the upper story fixtures at a later date when the gas line is placed into service. The rusting of joints, caused by using the line as a water line lowers the piping strength and presents a potential hazard in the form of gas leakage. Moreover, the rust and other solids will settle in the line and will fill the gas drip pockets. Some particles may enter the delicate controls and equipment where they will cause considerable difficulty. Gas lines are intended only to convey gas.

Installation of Water Supply Systems

Even though the water supply and its component waste piping are installed as a temporary system that will be dismantled after the construction work has been completed, such piping should be properly installed and maintained. A typical arrangement of such a system is shown in Fig. 1.

This figure shows that the water and waste piping extend from the lowest level of the building to the highest with water facilities and waste connections at each floor level. Often, two or more systems may be required, depending upon the size of the project. Proper connections must be made to the underground water and sewage systems. The waste system can be connected to the sanitary or storm sewers, or disposal may be by any other approved means.

Pipe for the water line is usually copper or other material recommended to meet the particular characteristics of the water. If the pipe has been used previously, extreme care should be taken to ensure that the pipe was cleaned for the new application. Since the water is to be used for drinking, it may be necessary to sterilize the pipe line before it is placed in service. This can be accomplished by adding a prescribed chemical solution containing chlorine which is permitted to remain in the line long enough for complete sterilization of the piping. When pipe is used to convey water for drinking purposes as well as for the construction needs, every care should be followed to assure a clean supply.

Water Supply and Waste Connections

There are any number of ways in which the water supply and waste connections can be arranged at each floor level. Each plumbing contractor has his own particular method which he uses. Figure 2 shows an arrangement that has been used on many construction projects.

This arrangement consists of a water supply, waste piping, a valve, vacuum breaker, hose bibb, a pail and a shallow pan with its waste connected to the waste line. Both the water and the waste line should be sized in accordance with the number of outlets that may be utilized in the building at one time. A safe method to use in sizing this line is to figure at least two thirds of the outlets being used at one time. It is a recommended practice to install vacuum breakers at each of the water connections. This will prevent the damage that back siphonage can cause in the event of a drop in water pressure. Should the water pressure be insufficient to furnish the proper amount of water at the highest building floors, then an approved method with mechanical means should be employed to boost the water pressure to the desired limits.

If the project is being erected in climates subjected to freezing weather, it is necessary to prevent damage from freezing by wrapping the pipe with an insulating covering. Here again, each contractor has his own particular method he favors to safeguard the piping.

The object of the pail is to intercept the water and avoid water splashing into the pan. Water splashing on the concrete slab develops a slippery condition that could cause accidents to construction workers.

Proper supports are a very necessary piping provision. Such supports should be placed on the vertical risers, as shown, to rigidily secure the pipe in position.

Support may also be required for the horizontal branch to the hose bibb, as shown, to keep this line from being bent out of place. The support also serves to hold this line in place when the construction hoses are pulled to the various floor areas.

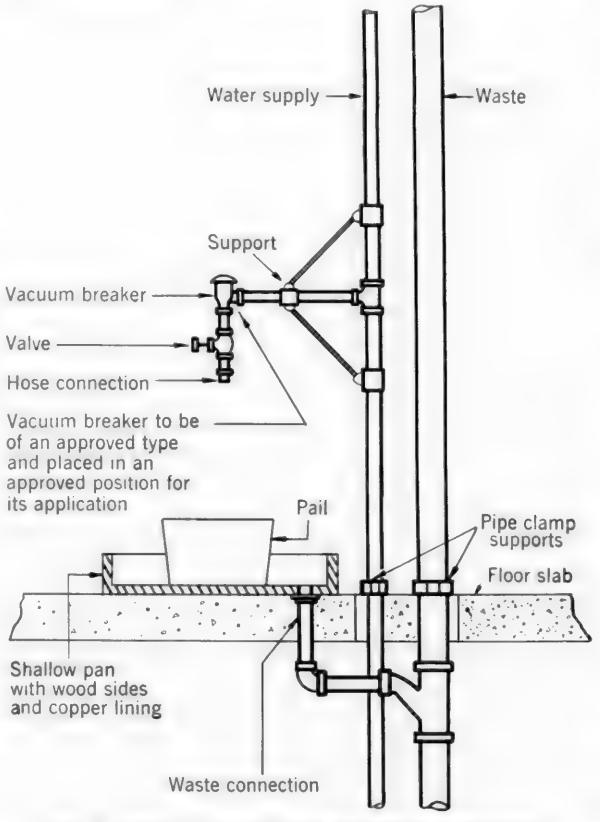


Fig. 2. Detail of water supply and waste connections.

Cleaning Up the Air

Methods of reducing smoke in small boiler plants, a blackness test for air cleaning plants, use of radio active argon for tracing the dispersal of chimney gases, and the Clean Air Bill which is now before the British Parliament, are commented on by our correspondent in London.

SOOT won't do our lungs any harm: after all, it makes a good fertilizer. Doctors throw gas and electric heaters out of sickrooms and insist on open coal fires. What is going to be done about the carbon monoxide in the exhaust from diesel engines and the heavy sulfurous fumes pouring out of Bankside Power Station? Just as much coal was being burnt 40 years ago as today, and the reason that stonework on buildings is now decaying so badly is that the sulfur is now attacking the stone, whereas years ago there was enough soot to absorb the sulfur gases. On the other hand "the deleterious effects of the oxides of sulfur are greatly enhanced by the presence of smoke particles."

What's the good of an automobile heater that has a grid on it "to keep out the larger insects" yet which in a busy street fills my auto with the exhaust of the vehicle in front? Air for my engine is carefully filtered; what about air for my lungs? In fact "the public are being misled by this clean air agitation" (and the man who wrote *that* is one of those who are responsible). All these fallacies and contradictions have been uttered or have appeared in print since the debate started on the Clean Air Bill.

Getting the Facts Straight

Well before some of us thought she would get around to it the Mother of Parliaments has begun to discuss a Government sponsored bill to deal with smoke, ash and grit in the atmosphere. The promise to do this was noted in *London Letter* last March. The draft of the bill is fairly innocuous, and the more controversial matters are carefully avoided. Control of domestic smoke is left to local authorities, who will introduce "smoke-controlled areas" as sufficient smokeless fuel becomes available and when local opinion compels action. The main assault is against technically backward industry. After some day early in 1958 it will be an offence to emit dark smoke from any factory chimney, and that includes the chimneys of any central heating plants. Various excuses are allowed, such as that the furnace was cold on lighting up, or that the furnace cannot be operated smokelessly and it has been impracticable to do anything about it, or that the proper fuel could not be obtained. But there is a time limit of 7 years for getting furnaces modernised, and all designs put in after 1948 must be "approved." "Dark smoke" is defined as that which would appear to be as dark as or darker than the Ringelmann No. 2 Chart. But in order to obtain conviction in court for the offence of emitting dark smoke it is not necessary to have actually used a Ringelmann Chart. In fact there is a special provision which looks forward to the use of other methods of deciding the darkness of smoke.

The chief interest has been in the public reception and discussion of the bill. The Member of Parliament whose speech (if reported correctly) showed that he did not know the difference between gasoline engines (which do emit carbon monoxide) and diesels (which don't, but which emit unburnt hydrocarbons); who also chose one of two power stations in the world where the flue gases are thoroughly washed to remove sulfur and called the comparatively clean (but very visible) clouds of harmless vapor "deadly sulfur;" the orthopedic surgeon who wrote the most unintentionally funny letter to *The Times* that that august journal has dared to print, and which was politely described as "regrettable" or as "deeply shocking" by those who wrote promptly to contradict him; these people can scarcely be blamed for their ignorance. It is only a relative ignorance, because the experts in air pollution know so little. This is proved by the way they argue with each other. And just to confound any smoke-control enthusiast, Manchester had a good dose of smog this fall. Manchester is an industrial city of a million or more inhabitants, depending on how much of the suburbs you count in. There would be nothing especially remarkable in such a place suffering from temperature inversion and a few days' smog; but Manchester made the center of the city a "smokeless zone" some years ago, and has been boasting of its success ever since.

Smoke Reduction in Central Heating Boilers

Faced with such shattering ignorance, the civil servants who drafted the Clean Air Bill have done a good job. They have left out, or only brought in permissively, all matters of real controversy, and have come down heavily on hand-fired boiler plants. One is left with the feeling that they have little hope of making much difference to the pollution question, but saw a good opportunity to get rid of plants which are wasteful of both fuel and labor, especially labor, and so help to improve efficiency and productivity.

When a layer of fresh coal is thrown on the top of a hot fuel bed it first dries and then the volatile matter is driven off. Except with the anthracites this volatile matter may comprise from a fifth to over a third the weight of the coal. It is evolved in the form of tarry vapors and gases. If the temperature of the furnace is low, these gases may be discharged from the chimney as a brownish smoke. But if the gases are heated further, without enough air to burn them completely, they will be "cracked" to form lighter hydrocarbons and soot, giving rise to black smoke. Solid particles of soot formed in this way are particularly difficult to burn. They are likely to be produced whenever a partly burnt flame impinges on a cold surface and becomes extinguished.

From this it is clear that there are three essentials for the avoidance of smoke: (a) enough air for combustion around the flame; (b) enough space for the flames to

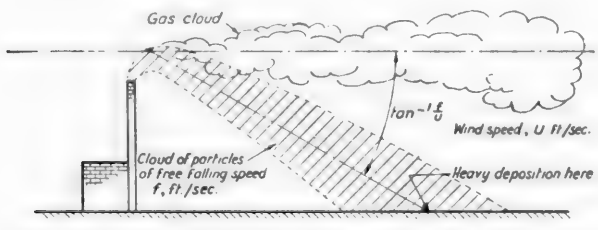
burn in without touching cool surfaces; (c) adequate mixing of the air with the gases by means of turbulence. The best means of providing these three essentials have been studied at the Fuel Research Station by T. F. Hurley and L. J. Flaws, who have published their results in the Journal of the Institution of Heating and Ventilating Engineers (**23,** 1).

The method of their approach was to provide in the fire door a large nozzle or nozzles for the entry of additional air. The best designs for various types of central heating boiler have been worked out and tested. They have not been patented so that they can be used freely by anyone. Complete smoke reduction was not achieved with coal, but one of the boilers was converted to oil firing. They found that it was not difficult to operate this without visible smoke, although there was a tendency for smoke to appear for a few seconds each time the burner cut in in response to the thermostat.

The loss of efficiency due to the use of too much excess air is well known. What is not so readily appreciated is the loss of heat due to unburnt gases if there is insufficient air. With oil firing, incomplete combustion occurred both with too little and with too much air. The following table shows the results with a vertical return-tube boiler fired with coal, when using the new type door and with the standard door supplied by the manufacturers.

Gross Heat Account		Using smoke eliminator fire-door	Using standard fire-door
Heat in steam (gross thermal efficiency)	per cent.	59·8	50 0
Heat lost in flue gas:			
(a) Dry products of combustion	per cent.	21·8	20 8
(b) Excess air	"	6 8	0 5
(c) Water vapour	"	6 8	5·6
(d) Combustible gases			
Heat lost in combustibles in (CO, H_2 and CH_4)	"	0·8	15 9
ashes and clinker	"	1·7	1·6
Balance of accounts (radiation, etc.)	"	2·3	5 6

An important part of any programme to reduce the emission of smoke and dust from chimneys must be the means for assessing the efficiency of grit-arresting equipment. The British Government's new Bill would make the installation of such equipment compulsory for all pulverised fuel plants of whatever size, and for all plants burning at least ten tons of solid fuel per hour in whatever manner. R. E. Rose, Reader in Mechanical Engineering, King's College, London, has contributed to the Journal of the Institution of Heating and Ventilating Engineers (**23,** 152) a paper entitled "A Study of the Blackness Test as a Means of Assessing the Performance of Air-Cleaning Plant."



Dust cloud and gas cloud from chimney. (Reproduced from the *Journal of the Institute of Fuel*)

In the test as described, the air or gas to be tested is drawn through filter paper and the blackness of the paper from the outlet gases compared with that produced with the gases at the inlet. The theoretical basis of this test is gone into from first principles and an equation derived. This equation has been found to be in accordance with the results of experiments carried out by the deposition of known quantities of powder upon white paper. The darkening was determined by the use of a standard commercial paint reflectometer. This is fitted with a set of color filters and can be used with dusts which do not appear "black" to the eye in daylight. The test also forms a possible means of determining the specific surface of a powder.

The efficiency of a gas-cleaning plant on a weight basis is identical with the efficiency deduced from the blackness test when the powder has a uniform particle size. A set of empirical curves have been derived for dust of wide size range which enable an efficiency on a weight basis to be obtained with sufficient accuracy for most purposes. The equation is given at the end of this *Letter*.

Chimneys and the Dispersal of Smoke

When all that can reasonably be done to emit clean flue gases has been done, there remains the problem of the dispersal of the residue around the neighborhood. J. E. Hawkins and G. Nonhebel of Imperial Chemical Industries, Ltd., have recently presented a paper on this matter to the Institute of Fuel (*Journal* **28,** *178*, 530). They have performed a most useful service in bringing together in one review nearly all that is known about this subject, particularly as it affects the chimneys of medium sized industrial and commercial plants. It is an interesting fact that for many years all arguments on the dispersal of smoke, fumes and dust have been based on the formulae of one of the authors' colleagues, C. H. Bosanquet. Each formula has stood and has been more or less accepted until this accomplished mathematician has pointed out the errors in it and has proposed a new formula, which everyone then dutifully uses instead. Yet a further modification is now put forward, the publication of this paper having unfortunately preceded the publication in another journal of the basis of the changes.

The diagram on this page illustrates the arguments advanced on the subject of dust deposition. The authors explain that as the gases move downwind the larger dust particles reach the ground before the finer particles and the gas itself. Higher winds might be expected to carry the dust further from the chimney, but these same higher winds reduce the *thermal rise* and the *velocity or momentum rise* of the gases above the top of the chimney. It appears that if the grit-arresting plant takes out all the dust above 150 microns in diameter, the maximum dust deposition may be expected to occur nine chimney heights downwind.

Power station flue gases are cleaned to such a high degree and are discharged from chimneys of such a height, that dust and grit nuisance from modern stations is not a matter for public concern. The biggest discussion is over the question of washing the gases to remove sulphur dioxide from them. This washing cools the gases, so con-

(*Concluded on page* 128)

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

WELDING stainless steel pipe requires special considerations and, therefore, the replies received from experts in the field of welding, should prove of interest and value.

The problem discussed and the one scheduled for treatment in the next issue are printed on this page. Should you have some comments that you would like to make regarding the coming discussion or if you have a question that you would present to our readers for comment, please write to the editor.

This Month's Problem

For welding stainless steel pipe in the field by manual means, there appears to be several ways of making the weld. Which method will give the most satisfactory results and which is the most economical to use? Are there any special steps for one to follow to insure a good weld?

Discussion of the Problem

The question presented covers an entire field rather than a specific welding application. Volumes have been written on the subject and yet it is not fully covered. I should like to take this opportunity to briefly point out some important considerations in the welding of stainless steels and perhaps emphasize a few points which have been misunderstood.

An often neglected consideration is the selection of the proper stainless steel for the specific application. The AISI series of stainless steels includes a large number of analyses, each type having a certain chemical composition, mechanical properties, corrosion resistance and greater or lesser ease of welding which is sometimes called weldability. If corrosion is a problem, then a stabilized stainless steel or one having a carbon content of 0.03% or less (called ELC) is required. Where mechanical properties alone are important, carbide precipitation is not a factor and other AISI types are used.

The stainless steels may be welded by a large number of arc-welding processes, all of which are suitable for pipe welding. These include shielded metal-arc welding with covered electrodes, inert-gas metal-arc welding using either the consumable electrode or nonconsumable electrode method, atomic hydrogen welding and submerged arc welding.

Covered electrodes are available for shielded metal-arc welding which have chemistries and properties essentially the same as the stainless steel base metal. These are standardized in the AWS-ASTM Specifications for Corrosion-Resisting Chromium and Chromium-Nickel Steel Covered Welding Electrodes. Filler metal for use with the other processes mentioned are covered in the AWS-ASTM Specifications for Corrosion-Resisting Chromium and Chromium-Nickel Steel Welding Rods and Bare Electrodes. The classification numbers used in both these specifications are similar to those used by AISI in identifying base metals.

Which process to use can only be determined on the basis of available facilities, amount of welding to be done, thicknesses involved, and these vary from job to job.

Shielded metal-arc welding can be done using a-c or d-c and is probably most suitable for field welding or welding on the site.

Inert-gas metal-arc welding may be done using either a tungsten electrode (the nonconsumable electrode method) or a filler metal electrode (the consumable electrode method). With the former method, d-c straight polarity is preferred for stainless steel piping with helium as the shielding gas except for thin wall tube when argon is more usual. An advantage of this process is that it may be used without added filler metal on thin-wall sections.

The consumable electrode method has been used to a lesser extent for stainless piping but appears to have a greater potential. D-C reverse polarity is generally used with helium, argon, a helium-argon mixture or a mixture of helium argon and oxygen (up to 2% oxygen) used. This addition of oxygen has been found to stabilize the arc action and reduce undercut. Where production warrants, an automatic setup can be used.

Submerged arc welding is used for shop welding where the pipe may be rotated so that all welding is confined to the flat position. This process is automatic and is especial-

Problem for the Coming Issue

To reduce the moisture in compressed air lines, we have compressor inter and aftercoolers. We have a number of compressors located in various parts of the plant. River water is used for the coolers and the cooler tubes get fouled up from the floating oil and muck in the river water. Are there water filters for use in these widely separated points in the plant that can reduce the number of tube cleanings? Is the maintenance of these filters cheaper than pulling out the tube nests, cleaning and then replacing them? What other benefits would follow the use of such filters?

ly applicable where the lengths of weld are long or the number of welds to be made is large. Atomic hydrogen welding is largely being replaced by inert-gas metal-arc welding.

Welding techniques are essentially the same as for welding the carbon steels. Joint geometry is basically the same and the usual cleanliness of the joint is required.

The Committee on Piping and Tubing found that stainless steel piping was often subjected to a postweld heat treatment where such treatment was not necessary or even undesirable. Recommended Practices for Postweld Heat Treatment of Austenitic Weldments summarizes the use of such a heat treatment as follows:

No heat treatment is required where: (a) corrosion resistance as welded is adequate; (b) high temperature strength is the primary service requirement, and in the absence of serious stress concentrations; (c) in relatively thin weldments.

Heating of the weldment or structure to a minimum of 1750 deg is recommended: (a) where dimensional stability must be assured; (b) for improved corrosion resistance of the weldment; (c) where improved mechanical properties are desired in high temperature service.

Simon A. Greenberg
Technical Secretary
American Welding Society

New York, N. Y.

The question on the welding of stainless steel pipe in the field is one that really requires extensive treatment to answer. A report that will make a good size pamphlet is being completed by the American Welding Society on the welding of stainless steel pipe and tube.

Of all the welding processes possible to use, two or three are the most practical and they are: Metal arc-welding with covered electrodes, inert-gas tungsten-arc welding and inert-gas arc-welding with consumable filler metal. While the question refers to stainless steel pipe. there is strong reason to believe that the reader means stainless steel tube since stainless steel, being expensive, is widely used in the tube form.

If the material is stainless steel pipe with the usual pipe wall thicknesses, then metal arc-welding with covered electrodes is suggested for field welding. It must be remembered that field welding involves the welding of pipe in all positions, not merely in the flat position. It is for this reason, namely the ability of metal arc-welding to handle all positions in a wide range of thicknesses, that metal arc-welding with covered electrodes is the first recommendation. Covered electrodes can be made in a wide variety of analyses by adjusting the composition of the electrode coating. Thus there are covered electrodes for virtually every stainless steel analysis.

When the welding is to be performed on pipe which is rotated, that is rolling welds, then the inert-gas metal-arc welding process with consumable filler metal may be used. This process is particularly suitable for metal thicknesses above about 1/8 to 3/16 inch.

If the welding of the light wall tube is involved, it is suggested that the tungsten-arc process be given serious consideration. The tungsten-arc process is particularly suitable for welding thin metals, and welding in all positions. On some thicknesses, it may be possible to weld without any introduction of filler metal. However, if necessary, filler metal may be added by this process.

As to which of the three processes listed would give the most satisfactory results, this can only be determined by considering the specific job requirements. Each process has its advantages and disadvantages which must be weighed in considering the whole picture. While the inert-arc processes may appear to be somewhat more costly than the other methods, it should be remembered that there are no problems of flux clean up after welding with these processes. Another important factor, where corrosion resistance is a problem, is the ability of these processes to preserve filler metal analysis almost intact.

Perhaps this could be summarized somewhat as follows:

1. Where all position welding of heavy wall stainless steel pipe, in the field, is necessary, use metal-arc welding with covered electrodes.
2. For metal shop welding of heavy well stainless steel pipe, in the flat positioning, consider the use of inert-gas metal-arc welding with consumable filler metal.
3. For welding light wall stainless steel tube, use inert-gas tungsten-arc welding with or without filler metal.

It is impossible to generalize on the suitability of any one process for the welding of stainless steel pipe. A great deal depends upon the nature of the service and the metals involved. The only conditions necessary to assure good welding are those normally associated with good welding practices.

A. N. Kugler
Chief Welding Engineer
Air Reduction Sales Company

New York, N. Y.

Air Conditioning Improves Ring Manufacture

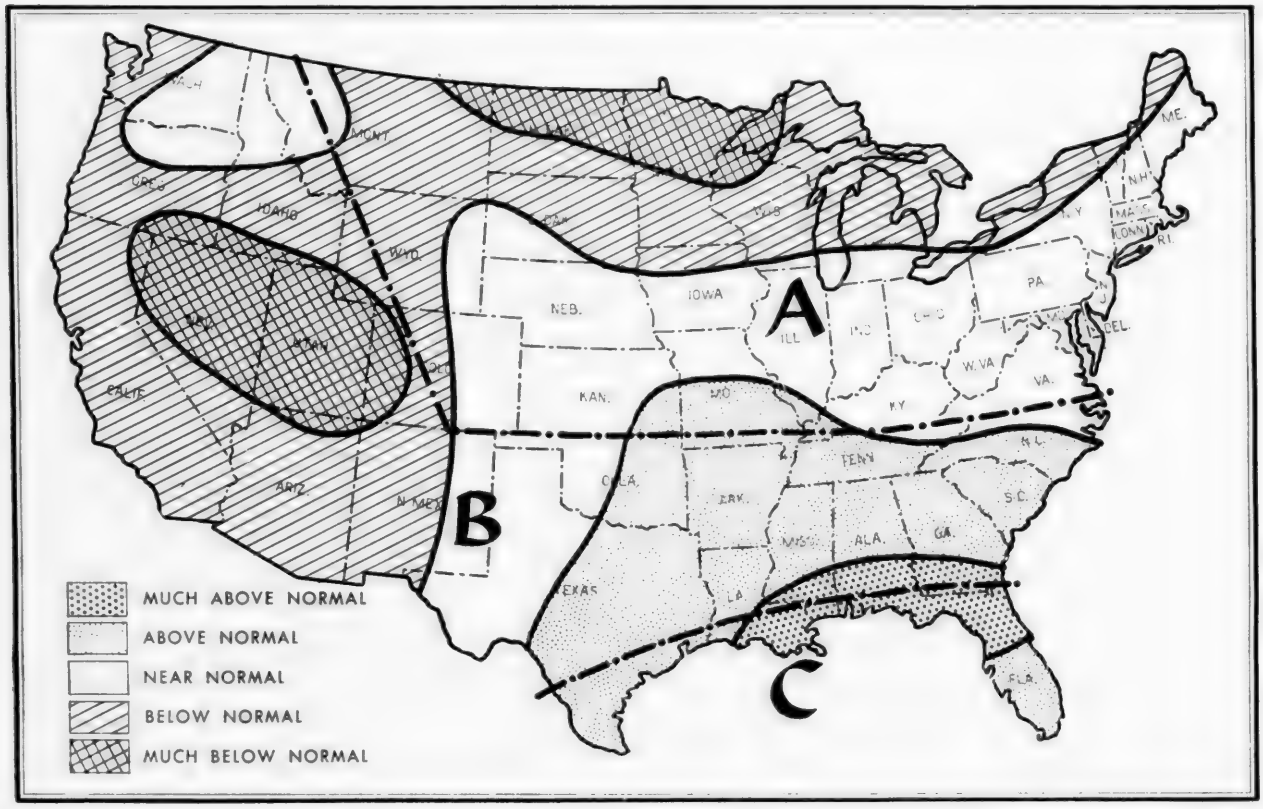
Sixty tons of water-cooled packaged air conditioning equipment was installed in the Avenue of the Americas, New York City plant of B. F. Hirsch Inc., one of the country's foremost ring manufacturing concerns. As part of the company's modernization program, two 15-ton Chrysler Airtemp packaged units were installed in the ring making and diamond setting areas of the Hirsch plant, another 15-ton unit handles the cooling requirements of general offices, private offices and storage vaults, and the fourth conditioner serves an employee cafeteria.

The precision work in ring manufacturing is highly exacting and utmost concentration is required when gold, platinum, and diamonds are being handled. Therefore, working environment must be as perfect as possible. In all respects the men must at all times be comfortable, relaxed and able to devote their full attention to the valuable pieces they are fashioning.

Packaged air conditioners were found to be the most adaptable for this application as it held ductwork to a minimum and offered the most economical operation because certain production areas must have cooling available throughout the entire year.

Temperature Forecast for January

Prepared for Air Conditioning, Heating and Ventilating by Long Range Weather Consultants



KEY BY REGIONS

	A	B	C
NEAR NORMAL	+ 2° to − 2°	+ 1° to − 1°	+ 1° to − 1°
ABOVE NORMAL	+ 3° to + 5°	+ 2° to + 4°	+ 2° to + 3°
MUCH ABOVE NORMAL	+ 6° or more	+ 5° or more	+ 4° or more
BELOW NORMAL	− 3° to − 5°	− 2° to − 4°	− 2° to − 3°
MUCH BELOW NORMAL	− 6° or more	− 5° or more	− 4° or more

THE month of January will average slightly warmer than December relative to the normal, in nearly all sections of the country except in the northeast, which will average about the same, and in the central Plateau area west of the Divide, which will average slightly colder than December.

Temperatures will average moderately below normal from the Great Lakes eastward through upstate New York and extreme northern New England, and westward to the Divide, with much below, more than 5° below normal, in northern sections of Minnesota and North Dakota. Elsewhere east of the Divide the January temperature will average close to normal, except that temperatures moderately above normal are indicated from eastern sections of Texas and Oklahoma eastward through the Carolinas to the Atlantic coast. Much above normal temperatures, about 4° above the normal, are expected in a narrow strip along the Gulf coast from New Orleans eastward to Jacksonville, Florida.

West of the Divide January temperatures will average generally moderately below normal, except near normal from eastern Washington and northeastern Oregon to western Montana, and much below normal, from 5° to 8° below, in most of Nevada, Utah and western Colorado. In most sections east of the Divide the earlier part of the month is expected to be warmer than the latter part.

Air Conditioning, Heating and Ventilating Index to Feature Articles

1955

In this index, grouped by broad subject matter and by author, only feature articles are included, excepting that Reference Data Sheets and Detail Sheets are also listed. The abbreviation *Ref. Sec.* indicates Reference Section.

This index, bound with the index of feature articles for 1950 to 1954, inclusive, is available as a single reprint which will be sent to any reader on request. Address Editor, Air Conditioning, Heating and Ventilating, 93 Worth St., New York 13, N. Y.

AIR CONDITIONING AND REFRIGERATION

Air Conditioned Bank, July, 1955, 78-79.
Air Conditioning a Central Computer, E. C. Lambert and J. C. Sims, July, 1955, 71-73.
Air Conditioning and Ventilating a Spring and Bumper Plant, L. Bratt, Sept. 1955, 99-102.
Air Conditioning Equipment Maintenance (Data Sheet), July, 1955, 158.
Air Conditioning Estimating Data (Data Sheet), Aug. 1955, 166.
Air Conditioning Existing Big Buildings, C. L. Ringquist, Oct. 1955, 87-91.
Air Conditioning for Los Angeles Civic Center Buildings, R. E. Phillips, Sr., July, 1955, 80-82.
Chilled Water System Serves Offices of New Industrial Plant, L. F. Gaffney, Aug. 1955, 105-107.
Design Corections for Altitude, N. L. Vinson, Feb. 1955, 91-96.
Energy Equations for Flow and Nonflow Systems (Ref. Sec.), F. W. Hutchinson, June, 1955, 97-110.
Engineered Air Conditioning, T. Hancock, May, 1955, 91-92.
Evaporative Condensers in Freon-12 Refrigerating Systems, O. B. Wert, April, 1955, 85-89.
Evaporative Cooling in Humid Areas, G. L. Schwarz, May, 1955, 93-94.
High Temperature Psychrometric Chart for Humid Air, J. R. Kayse, May, 1955, 86-90.
High Velocity System Design, L. R. Phillips, Jan. 1955, 92-93.
Hot Gas Defrosting Systems, Nov. 1955, 99-103.
Liquid Heating and Cooling for Year-Round Air Conditioning, W. B. Cooper, June, 1955, 89-95.
Maintaining Constant Relative Humidity, A. D. Benjamin, May, 1955, 83-85.
Philadelphia Landmark Is Air Conditioned, J. S. McCollam, Sept. 1955, 81-82.
Refrigeration Circuits (Detail Sheet), May, 1955, 103.
Refrigeration for Cooling Concrete Mix (Ref. Sec.), F. B. Kinley, Mar. 1955, 93-100.
Refrigeration Piping Hookup (Detail Sheet), Nov. 1955, 96.
Tables for Determining Absolute Humidity (Data Sheets), Jan. 1955, 174; Feb. 1955, 170; Mar. 1955, 172.
Tables for Determining Relative Humidity (Data Sheets), April, 1955, 180; May, 1955, 174; June, 1955, 174.
Units for Year-Round Air Conditioning, G. B. Priester, Dec. 1955, 98-103.
Valance Heating and Cooling System, G. B. Bailey and R. J. Lorenzi, Mar. 1955, 81-87.
Various Methods for Using Evaporative Condensers (Ref. Sec.), J. R. Harnish, July, 1955, 83-92.
Vibration and Noise in Refrigerant Pipe Lines, E. T. Neubauer, Mar. 1955, 88-89.
Water, Air, and Energy, F. W. Hutchinson, April, 1955, 90-95.

AIR FLOW AND AIR DISTRIBUTION

Damper Characteristics, G. T. Lang, July, 1955, 74-77.
Proper Location of Fans, A. N. Rogers, Aug. 1955, 83-84.

AIR SANITATION AND AIR POLLUTION

Industrial Reodorants, B. K. Tremaine, Feb. 1955, 83-85.
Sampling and Analyzing Air for Contaminants (Ref. Sec.), L. Silverman, Aug. 1955, 87-100.

APARTMENTS

Piping and Plumbing, L. Blendermann, Fire Protection for Apartment Houses, May, 1955, 140, 142; Fixture Roughing for Low Rent Housing Projects, July, 1955, 98-100.

ATOMIC ENERGY, HEATING BY
See Heating by Atomic Energy

AUXILIARY EQUIPMENT

How to Improve V-belt Drives, P. C. Ziemke, Jan. 1955, 94.
Part-Load Operation of Centrifugal Compressors, A. M. G. Moody, June, 1955, 85-88.
Practical Methods for Proper V-Belt Tension, F. H. Rumble, Dec. 1955, 77-78.

BANKS
See Commercial Buildings

BLOWERS
See Air Flow and Air Distribution

BOILERS AND CHIMNEYS

Costs Cut by Mechanical Draft, W. J. Matiez, June, 1955, 115-117.
High Capacity Boilers in Sweden, H. Lundbergh, Feb. 1955, 97-98.
How to Size and Install Gas Water Heaters Correctly, R. Murray, Feb. 1955, 86-90.
Use of Temperature Controls for House Heating Boilers, H. L. Mohn, Sept. 1955, 77-80; Oct. 1955, 98-102.

COMMERCIAL BUILDINGS

Air Conditioned Bank, July, 1955, 78-79.
Air Conditioning a Central Computer, E. C. Lambert and J. C. Sims, July, 1955, 71-73.
Air Conditioning Existing Big Buildings, C. L. Ringquist, Oct. 1955, 87-91.
Copper Drainage Pipe in Multi-story Buildings, H. E. Voegeli, Nov. 1955, 83-84.
Heating Entrance Areas (Detail Sheet), Mar. 1955, 101.
Philadelphia Landmark is Air Conditioned, J. S. McCollam, Sept. 1955, 81-82.

CONTROLS AND INSTRUMENTS

Basic Principles of Pneumatic Control Mechanisms (Ref. Sec.), W. G. Holzbock, Jan. 1955, 101-109.
Use of Temperature Controls for House Heating Boilers, H. L. Mohn, Sept. 1955, 77-80; Oct. 1955, 98-102.

CORROSION
See Water and Water Treatment

COURT DECISIONS
See Legal Questions and Court Decisions

DISTRICT HEATING
See Steam Heating

DOMESTIC HOT WATER
See Hot Water Heating

DUST COLLECTING
See Air Sanitation and Air Pollution

ELECTRIC HEATING

Estimating Electric House Heating Load, R. E. Sinclair, Jan. 1955, 95-96.

FANS
See Air Flow and Air Distribution

FORCED HOT WATER
See Hot Water Heating

GAS AND GAS HEATING

How to Size and Install Gas Water Heaters Correctly, R. Murray, Feb. 1955, 86-90.

HEAT AND HEAT TRANSFER

Applied Solar Energy, Dec. 1955, 73-76.
Fully Solar-Heated House, R. W. Bliss, Jr., Oct. 1955, 92-97.
Steam Losses from Steel Piping (Data Sheets), Sept. 1955, 160; Oct. 1955, 188; Nov. 1955, 170.
Thermal Stresses in Building Materials, June, 1955, 142-144, 162.
Water, Air and Energy, F. W. Hutchinson, April, 1955, 90-95.

HEAT LOSS
See Heat and Heat Transfer

HEATING BY ATOMIC ENERGY

Nuclear Space Heating, May, 1955, 111-112.

HIGH TEMPERATURE HOT WATER
See Hot Water Heating

HOSPITALS AND INSTITUTIONS

Air Conditioning for Los Angeles Civic Center Buildings, R. E. Phillips, Sr., July, 1955, 80-82.

HOT WATER HEATING

High Temperature Water (Ref. Sec.), O. S. Lieberg, Parts 1 and 2, Sept. 1955, 83-97; Parts 3 and 4, Nov. 1955, 86-95.
Indirect Water Heaters (Detail Sheets), April, 1955, 111; June, 1955, 112.
Liquid Heating and Cooling for Year-Round Air Conditioning, W. B. Cooper, June, 1955, 89-95.
Piping and Plumbing, L. Blendermann, Economy in Service Hot Water Generation, Mar. 1955, 111-112, 152; Supports for Hot Water Storage Generators, Dec. 1955, 95-97.
Service Hot Water Design for Multi-story Buildings (Ref. Sec.), F. M. Reiter, Dec. 1955, 79-94.

HUMAN COMFORT
See Air Conditioning and Refrigeration

INDUSTRIAL PLANTS

Air Conditioning and Ventilating a Spring and Bumper Plant, L. Bratt, Sept. 1955, 99-102.
Chilled Water System Serves Offices of New Industrial Plant, L. F. Gaffney, Aug. 1955, 105-107.
Refrigeration for Cooling Concrete Mix (Ref. Sec.), F. B. Kinley, Mar. 1955, 93-100.

LABORATORIES

Facilities for a Medical School and Research Center, W. Gardbane, Aug. 1955, 77-82.
Service Piping for Multi-story Laboratories (Ref. Sec.), J. E. York, May, 1955, 95-102.

LEGAL QUESTIONS AND COURT DECISIONS

Review of Important Law, L. T. Parker, Mar. 1955, 107-110.

PANEL HEATING
See Radiant Heating and Snow Melting

PIPING AND PLUMBING

Copper Drainage Pipe in Multi-story Buildings, H. E. Voegeli, Nov. 1955, 83-84.
Facts About Plastic Pipe, W. E. Jacobson, Jan. 1955, 87-91.
Frost Closure of Roof Vents in Plumbing Systems, April, 1955, 98.
Methods of Joining Plastic Pipe, W. E. Jacobson, Sept. 1955, 75-76.
Piping and Plumbing, L. Blendermann—Basic Design Data, Jan. 1955, 110-112; Vent Stack Terminal, Feb. 1955, 144, 146, 148; Economy in Service Hot Water Generation, Mar. 1955, 111-112, 152; Plumbing Codes, Apr, 1955, 120-121, 170; Fire Protection for Apartment Houses, May, 1955, 140, 142; Protection of Site Utility Lines, June, 1955, 111-112; Fixture Roughing for Low Rent Housing Projects, July, 1955, 98-100; Preventing Sewage Backflow in Buildings, Aug. 1955, 109-111; Importance of Cleanouts in a Building, Sept. 1955, 108-109; Increasing Water Supply Pressure in Buildings, Oct. 1955, 129-131; Design and Construction of Manholes, Nov. 1955, 105-107; Supports for Hot Water Storage Generators, Dec. 1955, 95-97.
Piping for Industrial Gases, Nov. 1955, 69-76.
Refrigeration Circuits (Detail Sheet), May, 1955, 103.
Refrigeration Piping Hookup (Detail Sheet), Nov. 1955, 96.
Safe Disposal Methods for Liquid Industrial Wastes (Ref. Sec.), E. B. Besselievre, April, 1955, 99-110.
Service Piping for Multi-story Laboratories (Ref. Sec.), J. E. York, May, 1955, 95-102.
Standpipe Systems (Detail Sheet), Oct. 1955, 127.
Steam Losses from Steel Piping (Data Sheets), Sept. 1955, 160; Oct. 1955, 188; Nov. 1955, 170; Dec. 1955, 162.
Unit Heater Piping Connections (Detail Sheets), July, 1955, 94; Aug. 1955, 102.
Vibration and Noise in Refrigerant Pipe Lines, E. T. Neubauer, Mar. 1955, 88-89.
Water Supply for Tall Buildings (Ref. Sec.), J. C. Church, Feb. 1955, 99-106.

OFFICE BUILDINGS
See Commercial Buildings

PLUMBING
See Piping and Plumbing

PUMPS
See Water and Water Treatment

RADIANT HEATING AND SNOW MELTING

Radiant Heating for Outdoor Applications, Aug. 1955, 101-102.
Snow Melting System Hydraulics, W. P. Chapman, Nov. 1955, 77-82.

REFRIGERATION
See Air Conditioning and Refrigeration

RESIDENCES

Warm Air Heating (Ref. Sec.), S. Konzo, Oct. 1955, 103-126.

SCHOOLS

Facilities for a Medical School and Research Center, W. Gardbane, Aug. 1955, 77-82.

SERVICE HOT WATER
See Hot Water Heating

SNOW MELTING
See Radiant Heating and Snow Melting

SOLAR HEAT
See Heat and Heat Transfer

STEAM HEATING

District Heating Progress, Nov. 1955, 108-109.
Flash Tank Design, T. W. Reynolds, April, 1955, 96-97.
Heating Entrance Areas (Detail Sheet), Mar. 1955, 101.
Hourly Water and Steam Demand Charts, R. A. Anderegg, May, 1955, 105.
Steam Consumption Cut 49.5% by Room Controlled Heating, S. MacMichael, July, 1955, 93-94.
Steam Losses from Steel Piping (Data Sheets), Sept. 1955, 160; Oct. 1955, 188; Nov. 1955, 170; Dec. 1955, 162.
Unit Heater Piping Connections (Detail Sheets), July, 1955, 94; Aug. 1955, 102.

UNIT HEATERS AND UNIT VENTILATORS
See Steam Heating

V-BELTS
See Auxiliary Equipment

VENTILATION

Booth for Metal Spraying; Hood Details for Baking Oven or Drier (Detail Sheet), Jan. 1955, 113.
Rear Hood for Tank or Table; Details of a Soldering Bench (Detail Sheet), Feb. 1955, 107.

WARM AIR HEATING

Valance Heating and Cooling System, G. B. Bailey and R. J. Lorenzi, Mar. 1955, 81-87.
Warm Air Heating (Ref. Sec.), S. Konzo, Oct. 1955, 103-126.

WATER AND WATER TREATMENT

Bedplates and Supports for Centrifugal Pumps, I. J. Karassik and R. Carter, May, 1955, 108-110.
Centrifugal Pump Bearings, I. J. Karassik and R. Carter, Jan. 1955, 97-100.
Centrifugal Pump Couplings, I. J. Karassik and R. Carter, Feb. 1955, 109-112.
Centrifugal Pump Materials, I. J. Karassik and R. Carter, June, 1955, 120-123.
Hourly Water and Steam Demand Charts, R. A. Anderegg, May, 1955, 105.
New Plastic Guards Tanks Against Corrosion, J. D. Roper, Aug. 1955, 85-86.
Vertical Dry Pit Centrifugal Pumps, I. J. Karassik and R. Carter, Mar. 1955, 103-106.
Vertical Wet-Pit Centrifugal Pumps, I. J. Karassik and R. Carter, April, 1955, 116-119.
Water Supply for Tall Buildings (Ref. Sec.), J. C. Church, Feb. 1955, 99-106.

Index to Authors

Anderegg, R. A., Consulting Engineer—Hourly Water and Steam Demand Charts, May, 1955, 105.
Bailey, G. B., Executive Director, and Lorenzi, R. J., Research Engineer, John B. Pierce Foundation of Connecticut, Inc.—The Valance Heating and Cooling System, Mar. 1955, 81-87.
Benjamin, A. D., Project Engineer, Voorhees, Walker, Smith & Smith—Maintaining Constant Relative Humidity, May, 1955, 83-85.
Besselievre, E. B., Manager, Industrial Wastes Division, Kaighin & Hughes, Inc. —Safe Disposal Methods for Liquid Industrial Wastes (Ref. Sec.), April, 1955, 99-110.
Blende mann, L., Consulting Engineer—Piping and Plumbing — Basic Design Data Jan. 1955. 110-112; Vent Stack Terminal, Feb. 1955, 144, 146, 148; Economy in Service Hot Water Generation, Mar. 1955, 111-112, 152; Plumbing Codes, April, 1955, 120-121, 170; Fire Protection for Apartment Houses, May, 1955, 140, 142; Protection of Site Utility Lines, June, 1955, 111-112; Fixture Roughing for Low Rent Housing Projects, July, 1955, 98-100; Preventing Sewage Backflow in Buildings, Aug. 1955, 109-111; Importance of Cleanouts in a Building, Sept. 1955, 108-109; Increasing Water Supply Pressure in Buildings, Oct. 1955, 129-131; Design and Construction of Manholes, Nov. 1955, 105-107; Supports for Hot Water Storage Generators, Dec. 1955, 95-97.
Bliss, R. W., Jr., Donovan and Bliss—Fully Solar-Heated House, Oct. 1955, 92-97.
Bratt, L., Mechanical Engineer, Albert Kahn Associated Architects & Engineers, Inc.—Air Conditioning and Ventilating a Spring and Bumper Plant, Sept. 1955, 99-102.
Carter, R., Volute Pump Section, and Karassik, I. J., Manager, Multi Stage Pump Section, Worthington Corp.—Centrifugal Pump Bearings, Jan. 1955, 97-100; Centrifugal Pump Couplings, Feb. 1955, 109-112; Vertical Dry Pit Centrifugal Pumps, Mar. 1955, 103-106; Vertical Wet-Pit Centrifugal Pumps, April, 1955, 116-119; Bedplates and Supports for Centrifugal Pumps, May, 1955, 108-110; Centrifugal Pump Materials, June, 1955, 120-123.
Chapman, W. P., National Tube Div., United States Steel Corp.—Snow Melting System Hydraulics, Nov. 1955, 77-82.
Church, J. C., Syska and Hennessy—Water Supply for Tall Buildings (Ref. Sec.), Feb. 1955, 99-106.
Cooper, W. B., Manager, Heating & Cooling Products, Plumbing and Heating Division, American Radiator & Standard Sanitary Corp. — Liquid Heating and Cooling for Year-Round Air Conditioning, June, 1955, 89-95.
Gaffney, L. F., Mechanical Engineer, Plant Engineering, Western Electric Co., Inc.—Chilled Water System Serves Offices of New Industrial Plant, Aug. 1955, 105-107.
Gardbane, W., Assistant Plumbing Trade Chief, Syska & Hennessy, Inc.—Facilities for a Medical School and Research Center, Aug. 1955, 77-82.
Hancock, T., Executive Vice-President, The Trane Co.—Engineered Air Conditioning, May, 1955, 91-92.
Harnish, J. R., York Corp.—Various Methods for Using Evaporative Condensers (Ref. Sec.), July, 1955, 83-92.
Holzbock, W. G., Askania Regulator Co.—Basic Principles of Pneumatic Control Mechanisms (Ref. Sec.), Jan. 1955, 101-109.
Hutchinson, F. W., Assistant Professor, Dept. of Mechanical Engineering, University of California—Energy Equations for Flow and Nonflow Systems (Ref. Sec.), June, 1955, 97-110; Water, Air, and Energy, April, 1955, 90-95.
Jacobson, W. E., General Manager, Yardley Plastics Co.—Facts About Plastic Pipe, Jan. 1955, 87-91; Methods of Joining Plastic Pipe, Sept. 1955, 75-76.
Karassik, I. J., Manager, Multi Stage Pump Section, and Carter, R., Volute Pump Section, Worthington Corp.—Centrifugal Pump Bearings, Jan. 1955, 97-100; Centrifugal Pump Couplings, Feb. 1955, 109-112; Vertical Dry Pit Centrifugal Pumps, Mar. 1955, 103-106; Vertical Wet-Pit Centrifugal Pumps, April, 1955, 116-119; Bedplates and Supports for Centrifugal Pumps, May, 1955, 108-110; Centrifugal Pump Materials, June, 1955, 120-123.
Kayse, J. R., American Air Filter Co., Inc.—High Temperature Psychrometric Chart for Humid Air, May, 1955, 86-90.
Kinley, F. B., Senior Application Engineer, Industrial Division, Engineering Dept., York Corp.—Refrigeration for Cooling Concrete Mix (Ref. Sec.), Mar. 1955, 93-100.
Konzo, S., Professor of Mechanical Engineering, Dept. of Mechanical Engineering, University of Illinois—Warm Air Heating (Ref. Sec.), Oct. 1955, 103-126.
Lambert, E. C., Air Conditioning Division, Sales Office, Westinghouse Electric Corp. and Sims, J. C., Eckert-Mauchly Division, Remington Rand, Inc.—Air Conditioning a Central Computer, July, 1955, 71-73.
Lang, T. G., Engineer—Damper Characteristics, July, 1955, 74-77.
Lieberg, O. S., Consulting Engineer, Consentini Associates — High Temperature Water (Ref. Sec.), Parts 1 and 2, Sept. 1955, 83-97; Parts 3 and 4, Nov. 1955, 86-95.
Lorenzi, R. J., Research Engineer, and Bailey, G. B., Executive Director, John B. Pierce Foundation of Connecticut, Inc.—The Valance Heating and Cooling System, Mar. 1955, 81-87.
Lundbergh, H., The American-Swedish News Exchange, Inc. — High Capacity Boilers in Sweden, Feb. 1955, 97-98.
MacMichael, S., District Sales Manager, Iron Fireman Corp.—Steam Consumption Cut 49.5% by Room Controlled Heating, July, 1955, 93-94.

Matiez, W. J., L. J. Wing Mfg. Co.—Costs Cut by Mechanical Draft, June, 1955, 115-117.

McCollam, J. S., Middle Atlantic District, York Corp.—Philadelphia Landmark is Air Conditioned, Sept. 1955, 81-82.

Mohn, H. L., Project Engineer, York-Shipley, Inc.—Use of Temperature Controls for House Heating Boilers, Sept. 1955, 77-80; Oct. 1955, 98-102.

Moody, A. M. G., Senior Development Engineer, Product Engineering Dept., The Trane Co.—Part-Load Operation of Centrifugal Compressors, June, 1955, 85-88.

Murray, R., American Gas Association—How to Size and Install Gas Water Heaters Correctly, Feb. 1955, 86-90.

Neubauer, E. T., Senior Development Engineer, Refrigeration Section, The Trane Co.—Vibration and Noise in Refrigerant Pipe Lines, Mar. 1955, 88-89.

Parker, L. T., Attorney-at-Law—Review of Important Law, Mar. 1955, 107-110.

Phillips, L. R., Anemostat Corporation of America—High Velocity System Design, Jan. 1955, 92-93.

Phillips, R. E., Sr., Member of Ralph E. Phillips, Inc., Consulting Engineers—Air Conditioning for Los Angeles Civic Center Buildings, July, 1955, 80-82.

Priester, G. B., Air Conditioning Engineer, Baltimore Gas and Electric Co.—Units for Year-Round Air Conditioning, Dec. 1955, 98-103.

Reiter, F. M., Fuel Engineer, The Dayton Power and Light Co.—Service Hot Water Design for Multi-story Buildings (Ref. Sec.), Dec. 1955, 79-94.

Reynolds, T. W.—Flash Tank Design, April, 1955, 96-97.

Ringquist, C. L., Air Conditioning Unit Sales Dept., The Trane Co.—Air Conditioning Existing Big Buildings, Oct. 1955, 87-91.

Rogers, A. N., General Purpose Fan Products, Westinghouse Electric Corp.—Proper Location of Fans, Aug. 1955, 83-84.

Roper, J. D., President, Roper Manufacturing Co.—New Plastic Guards Tanks Against Corrosion, Aug. 1955, 85-86.

Rumble, F. H., Allis-Chalmers Mfg. Co.—Practical Methods for Proper V-Belt Tension, Dec. 1955, 77-78.

Schwarz, G. L., Consulting Engineer—Evaporative Cooling in Humid Areas, May, 1955, 93-94.

Silverman, L., Associate Professor of Industrial Hygiene, Harvard School of Public Health—Sampling and Analyzing Air for Contaminants (Ref. Sec.), Aug. 1955, 87-100.

Sims, J. C., Eckert-Mauchly Division, Remington Rand, Inc., and Lambert, E. C., Air Conditioning Division, Sales Office, Westinghouse Electric Corp.—Air Conditioning a Central Computer, July, 1955, 71-73.

Sinclair, R. E., Assistant to Division Manager, Northwestern Division, Pacific Power & Light Co.—Estimated Electric House Heating Load, Jan. 1955, 95-96.

Tremaine, B. K., Technical Director, Rhodia, Inc.—Industrial Reodorants, Feb. 1955, 83-85.

Vinson, N. L.—Design Corrections for Altitude, Feb. 1955, 91-96.

Voegeli, H. E., Development Engineer, The American Brass Co.—Copper Drainage Pipe in Multi-story Buildings, Nov. 1955, 83-84.

Wert, O. B., Manager Technical Data and Training Section, Air Conditioning and Refrigerating Division, Worthington Corp. — Evaporative Condensers in Freon-12 Refrigerating Systems, April, 1955, 85-89.

York, J. E., Building Service Engineer, Stone & Webster Engineering Corp.—Service Piping for Multi-story Laboratories (Ref. Sec.), May, 1955, 95-102.

Ziemke, P. C.—How to Improve V-belt Drives, Jan. 1955, 94.

BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

PIPING STRESS CALCULATIONS SIMPLIFIED

The fifth edition of Piping Stress Calculations Simplified, by S. W. Spielvogel of the Mechanical Engineering Department, Consolidated Edison Co., New York, N. Y. is now available.

The book is arranged in such a manner that one familiar with pipe calculations can refer quickly to formulas or computations involved in any specific case without reviewing the theoretical background. Computation forms are arranged to permit sharing of labor on three-dimensional piping systems by allocating parts of the work to several persons. The method is exact within slide rule accuracy.

This book, which is not new to engineers, should bring the ordinary layout problem well within the grasp of many who wish practical answers to immediate piping layouts.

This edition incorporates the provisions of the 1955 American Standard Association Code for Pressure Piping. Problems used in this edition have been adjusted to conform to this concept of stress-range.

Piping Stress Calculations Simplified, by S. W. Spielvogel. Spiral binding, page size 8½ x 11 inches, 133 pages. Published by the author, 15 Old Field Lane, Lake Success, N. Y. Price, $5.

ELECTRICAL ENGINEERING

A basic book that has enjoyed wide use is Principles and Practices of Electrical Engineering, first published in 1914. The earlier editions were written by the late Alexander Gray, professor of electrical engineering, Cornell University. The seventh edition which has just been published has been revised by G. A. Wallace, professor of electrical engineering, McGill University.

The revision has been thorough and at least 20% of the articles are either new or have been completely rewritten. In the current revision, the general character of the book has not changed and it remains an elementary textbook. The chapter on Thermionic Tubes has been rewritten and the figures redrawn to improve the treatment and to modernize the illustrations and symbols.

Briefly the textbook presents a brief review of those areas of electrical physics which must be mastered in order to understand the generation, transmission and utilization of electric power; a description and explanation of the operating principles of generators, motors, transformers, batteries, transmission lines, meters, illumination, thermionic-tube rectifiers, amplifiers, oscillators, control devices, photoelectric tubes and cells, and a treatment of electric and magnetic circuits.

Principles and Practices of Electrical Engineering, by A. Gray and G. A. Wallace. Cloth bound, 6 x 9 inches, 598 pages. Published by McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 36, N. Y.

AIR POLLUTION CONTROL

The First International Congress on Air Pollution was held in March, 1955 under the sponsorship of The American Society of Mechanical Engineers. Air pollution experts from six foreign countries, as well as many from the United States, participated in this congress.

Papers presented form the basis of Problems and Control of Air Pollution which is edited by Frederick S. Mallette, executive secretary, Committee on Air Pollution Controls, The American Society of Mechanical Engineers. Included are 25 papers.

The technical information is grouped under the main heads of gaps in the available knowledge on air pollution, current developments in air pollution, sulfur dioxide—treatment and recovery, and experience in pollution abroad.

Problems and Control of Air Pollution, edited by F. S. Mallette. Cloth bound, 6 x 9 inches, 272 pages. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price, $7.50.

(*Concluded on page* 112)

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on page 131 for securing additional information on new equipment and materials described in this department.

Medium-Size Boiler

A boiler has been designed for large homes, one- or two-story commercial buildings, clinics, and similar installations by Crane Co., Chicago, Ill.

Called the Sunnyday 20, the boiler is an intermediate size between the small residential and the large commercial boilers.

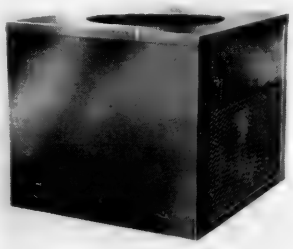
Although designed primarily as an oil-fired boiler, it can also be adapted to gas or coal firing. It is available with an extended jacket, in a two-tone gray hammerloid finish, as well as with a flush jacket. Both jackets are insulated with cemented-on, 1-in. thick Fiberglas.

For service hot water, there are two integral water heaters designed to fit the boiler: a new flush-type instantaneous tankless heater that fits inside the boiler and eliminates the need for a separate storage tank; and a trombone storage-type water heater that screws into a boiler tapping.

More information? Circle Item 1 on postcard, page 131.

Central Air Conditioner

A 2-hp, air-cooled, remote, central air conditioning system is offered by Addison Products Co., Addison, Mich., as an economy model for sale to original equipment manufacturers only.



Both the compressor-condenser unit and the plenum type evaporator have been reduced in size. The condensing unit has been reduced in all three dimensions to occupy less than half the volume required for the equivalent 1955 model. The evaporator unit has also been similary reduced in size for easier installation in furnace housing, plenum chamber, supply duct work, or beneath downflow units.

The evaporator unit may be purchased with or without a housing and will fit in a customer's present cabinet. The design also incorporates a feature which provides for differences in duct load. The company's regular design features such as adjustable legs, Tecumseh hermetic compressor, and a heavy duty fan motor are features of the new system as well.

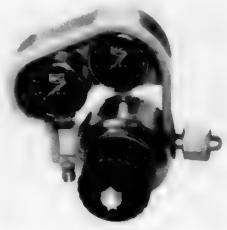
As in 1955, manufacturers may purchase the individual units or the complete system, including the control panel, furnished as an assembly.

More information? Circle Item 2 on postcard, page 131.

Industrial Gas Regulators

A line of gas regulators that are protected against rough handling is announced by K-G Equipment Co., Inc., Allentown, Pa.

The regulator has a patented gage guard with a positive, spring lock action, protecting the gage from accidental breakage. A stainless steel nipple is designed to withstand the impact of an accidental cylinder upset, and a stainless steel adjusting screw prevents its becoming damaged. The pressure adjustment is made by means of an enclosed thrust bearing that is integral with the adjusting mechanism.



All internal parts are made of stainless steel; body and bonnet are forgings made of a new aluminum alloy. A sintered stainless steel filtered check-valve unit prevents failure of the regulator seat by protecting the precision internal parts.

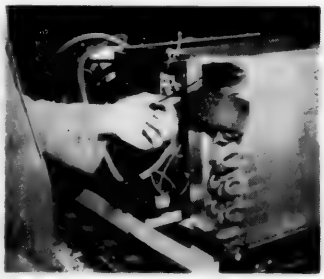
The regulators are available in both single and two-stage models for most compressed gases and are recommended particularly for the construction, railroad, and heavy industries.

A new bulletin with detailed information, is available from the manufacturer.

More information? Circle Item 3 on postcard, page 131.

Cold Pipe Insulation

An insulation wrap for preventing condensation-dripping from cold pipes is manufactured by Presstite Engineering Co., St. Louis, Mo. It is available in rolls of 30-ft lengths, 3/16 and ¼ in. thick, and various widths to accommodate different pipe circumferences.



A feature of the wrap is its shape and its method of application; it is extruded, with bevelled sides. This permits longitudinal application to the pipe. The 30-ft strip is cross cut each 24 in. so it can be separated in 2-ft lengths for application. It is held along the length of pipe on the underside and then pressed up and around the pipe (or tubing); the self-sealing bevelled edges are pressed together to form a uniform covering. The next strip is butted up against the first, and so on along the entire pipe.

Because the essential function of the wrap is insulating cold pipes, it is composed of 100% solids that withstand pipe temperatures from −20 to 200 deg F, without becoming brittle or soft. It is self-sealing and requires no cement to apply.

More information? Circle Item 4 on postcard, page 131.

Valve's Diaphragm Floats

Solenoid valves with a floating synthetic diaphragm are made by Division C, Jackes-Evans Mfg. Co., St. Louis, Mo., for fluid flow at pressure differentials between 1 and 250 psi. They are guaranteed by the manufacturer for a period of eighteen months.

Pilot operated with no metal-to-metal contacts, the valves are used for the control of water, air, brine, light oils, industrial gas, Freon 12 and 22, and other non-corrosive fluids at temperatures from 0 to 225 deg F. They may be employed in air conditioning, refrigeration, hot water heating, laundry equipment, dish washers, and hydraulic pressure systems.

More information? Circle Item 5 on postcard, page 131.

Refrigerant Dispensing Valve

A refrigerant dispensing valve, called Taps-All, that fits either of the packaged refrigerant brands now on the market is introduced by Madden Brass Products Co., Aurora, Ill.

Carrying part No. UDV-100, the valve is designed to dispense packaged refrigerants from the two widely used 1- and 2-lb cans. Directions accompanying the valve describe how it may be used to dispense refrigerant from either of the packaged styles. The valve is intended to simplify inventory in that it can be used regardless of what brand of packaged refrigerant is stocked.

Standard packing of the valve by the manufacturer is 12 per shipping carton. The approximate weight of each carton is 2½ lb. Seal gaskets for the valve are also available from the manufacturer.

More information? Circle Item 6 on postcard, page 131.

Low Temperature Warning

A low temperature warning device, called Alarm-A-Lite, which automatically flashes a household lamp if the temperature in an unoccupied home drops below a safe level, has been developed by Custom Mfg. Co., Chicago, Ill. The device is designed to prevent damage to a home from lack of heat, while the family is away, should automatic heating controls fail.

Controlled to flash at 50 deg F, the device will continue to flash a lamp until the temperature is again raised to a safe level. It automatically resets itself, is 2 in. in diameter, 3½ in. long, uses no current unless an alarm is given, and operates off 110v.

The lamp should have a 100 watt bulb in it, preferably red, so that it can be seen in daylight, and should be placed in a window so that it can be observed by a neighbor or passerby.

More information? Circle Item 7 on postcard, page 131.

Indicator Checks Filters

An automatic device to indicate when unit ventilator filters need replacement has been developed by Herman Nelson Unit Ventilator Products, American Air Filter Co., Inc., Louisville, Ky.

The filter indicator provides a constant check of a filter's condition. When a filter accumulates its maximum dust load and its efficiency begins to be seriously impaired, the indicator causes the words *change filter* to appear on the front of the unit ventilator cabinet. Thus, maintenance men need not open the cabinet periodically to inspect the filter.

The filter indicator operates on the principle of constantly measuring the resistance to air flow through the filter. It requires no maintenance or adjustment.

The indicator will be available as a factory-mounted accessory on the company's unit ventilators. Kits will also be available for installation on existing unit ventilators.

More information? Circle Item 8 on postcard, page 131.

Combination Baseboard

A baseboard called Perim-A-Base is available from Berger Furnace Corp., Belle Vernon, Pa., for heating or cooling from the same baseboard panel.

Although the baseboard has been used in the past for split duct heating and cooling systems, the company has developed it so that it will now deliver both heated and cooled air to living quarters.

However, the company will continue to manufacture the original baseboard panel. It will be used for installations where heating alone is needed or where the more expensive split duct system of cooling will be used. At anytime after its installation, the original panel can still be converted to the new combination (PC) panel by replacing the front panels only.

During the heating cycle, the new baseboard panel operates exactly as the original—discharging the heated air into the room at a wide divergent angle and at a low velocity so as not to create drafts; it also gives off radiant heat from its lower chamber which is pressurized to maintain high temperatures on its exposed metal surfaces. It is a continuous panel covering the base of the exposed wall.

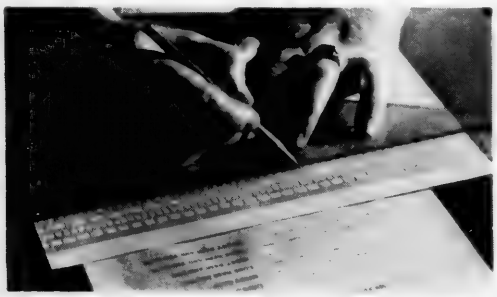
Slots at the top of the discharge chamber of the new panel are so proportioned that when it is used on the cooling cycle it will emit the air at sufficiently high velocity to assure that the cooled air will blanket the outside wall and will travel uniformly upward and across the ceiling. The cooled air will then disperse throughout the room.

More information? Circle Item 9 on postcard, page 131.

Template for Piping Drawings

A template which enables a draftsman to draw dot and dash lines with a rapid stroke of a pencil or ball-point pen, is a new product of dot-N-dasher, Cresskill, N. J.

Designed by a professional engineer for making piping drawings, the template is applicable to any type of architectural or mechanical drawing where broken-line combinations are desired. The template will produce six



different lines: long dash, short dash, long dash and dot, short dash and dot, long dash and two dots, and short dash and two dots. The hardness of the pencil determines the density of the line.

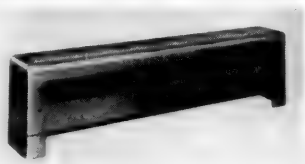
Made of exceptionally strong and durable transparent, plastic (Mylar), 0.0075 inches thick, the template is used by placing a straight edge on the desired stencil and quickly drawing the line. Its use saves considerable time on what has previously been a tedious job.

Price of the template is $1.25.

More information? Circle Item 10 on postcard, page 131.

Picture Window Convector

A line of picture window convectors has been developed by C. A. Dunham Co., Chicago, Ill. The convectors heat and block cold downdrafts around picture windows.



Standing 12 in. high, the convectors can be mounted on the floor, partially or completely recessed below picture windows. They have rounded corners and edges for safety and appearance and are available in lengths up to 112 in. Heavy gage steel units have front panels braced with stiffeners.

The heating element consists of aluminum fins and copper tubes silver brazed into a cast bronze header. The tubes are expanded into the fins to assure tight mechanical bond.

More information? Circle Item 11 on postcard, page 131.

Device Slows Gas Flow

A vent device which is applicable to monoport burners used in small combustion chambers for residential heating is introduced by Penn Controls, Inc., Goshen, Ind. The device prevents flame roll-over which causes the pilot to go out and the flame to flash.

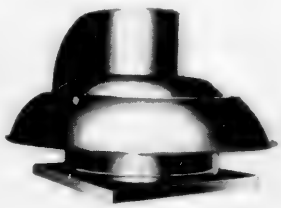
Since its action is to slow down the delivery of gas when the main valve opens, the soft-lighting device cannot be used with downstream pilots. It screws into the vent outlet on the company's Series 931 gas appliance pressure regulators and consists of a machined aluminum body, a seat insert, and a Nylon ball.

Minimum delay timing is set as follows: with a 3.5-in. outlet pressure setting and a flow rate of not less than 60,000 Btu per hr (natural gas), the time to reach a 2-in. outlet pressure after downstream main gas valve opens will be held to a minimum of 4 sec. At greater flow rates, this time increases.

More information? Circle Item 12 on postcard, page 131.

Low Silhouette Roof Ventilator

A centrifugal roof ventilator has been designed by DeBothezat Fans Div., American Machine and Metals, Inc., East Moline, Ill., for buildings where pleasing appearance and quiet performance are prime requisites.



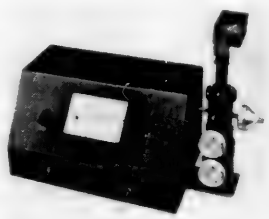
The ventilator moves large volumes of air against static pressures at low speeds and noise levels. Its large unit exhaust capacity is accomplished at low fan tip speeds by a backwardly curved, non-overloading, centrifugal fan wheel. The wheel runs in a Venturi shaped inlet ring which further reduces air turbulence noise and increases operating efficiency.

Low in silhouette, the roof ventilator is designed to blend with modern architecture. The manufacturer offers a bulletin, DR-40-55, which contains a section on how to select a roof ventilator.

More information? Circle Item 13 on postcard, page 131.

Aerosol and Smoke Photometer

A forward-scattering aerosol and smoke photometer is announced by Phoenix Precision Instrument Co., Philadelphia, Pa. It is a portable unit designed for the study, measurement, and control of air pollution and particulate matter suspended in aerosols. However, it has other applications such as a control and research tool for rapid evaluation in filter designs, testing efficiency of fans, air-wash systems, and air conditioners or in medical research for studies and measurement of respiratory accumulation of dust and smoke particles.



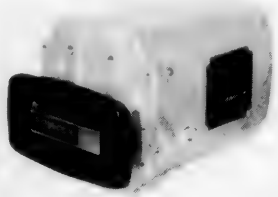
The instrument measures forward-scattering at small angles which may be 100 to 10,000 times greater than the scattering in all other directions.

Standard and special accessories are available such as recorders and logarithmic and linear amplifiers which further extend the instrument's usefulness.

More information? Circle Item 14 on postcard, page 131.

Process Flow Integrator

A pneumatic integrator, Model 14A, that requires no cams for square root extraction, has been designed by The Foxboro Co., Foxboro, Mass. The device provides continuous linear integration of industrial process flows to within ½% accuracy.



In operation, the integrator receives a 3-15 psi measurement signal from a differential pressure transmitter. This signal, applied through a bellows, positions a force bar in relation to a nozzle. The resulting back pressure at the nozzle, amplified by an air relay, regulates a jet of air onto the blades of a turbine wheel. As the wheel revolves, a weight, pivoted on the wheel, produces a centrifugal force. This is fed back to the bar to balance the measurement signal. The revolving turbine wheel is geared to a counter which totalizes the flow.

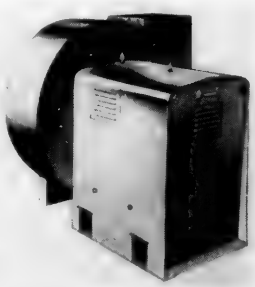
Thus, a flow change is reflected in a change of wheel speed and a rebalancing of forces. The centrifugal principle extracts the square root factor introduced by the differential pressure measurement so that the integration of flow is linear.

The device is weatherproof, dust-proof and self-purged; it can be panel or field mounted. The gears are replaceable for whatever unit of flow measurement is desired. All circuits are pneumatic; conventional 20-psi air or gas supply is required.

More information? Circle Item 15 on postcard, page 131.

Industrial Fans

A line of industrial fans with a streamlined design is available from American Blower Corporation, Detroit, Mich. The line provides coverage of the full range of industrial requirements and features a new packaged industrial fan (illustrated), complete with motor, V-belt drive, and running gear enclosure.



Designated Series 106, the industrial fans are available in sizes 11 through 37 with adjustable discharges in V-belt driven arrangements Nos. 1 and 9 for the full range, and in direct-connected arrangements 4 and 8 for limited sizes. Fan sizes 11 through 37 permit a choice of three types of wheels: AH (air handling), MH (material handling), and LS (long shavings). In sizes 41 through 60, the units are available with a fixed discharge in arrangement 1 and a choice of two types of bearing supports. Fan sizes 41 through 60 can be obtained with either of two types of wheels, AH or MH.

The packaged industrial fan is a self-contained unit that does not require a separate motor foundation. It is available in sizes 11 through 26 with adjustable discharge housings. MH wheels only are standard with the packaged units; AH or LS wheels can be furnished on special order.

In sizes 11 through 37, the fans are available for volumes to 47,000 cfm operating with static pressures to 18 inches of water. The adjustable discharge sizes provide wheel diameters to 64⅜ in. and inlet diameters to 37 in. Fixed discharge units handle volumes to 125,000 cfm at static pressures to 18 inches of water. Sizes 41 through 60 come equipped with wheels to 104¼ in. diameter and inlets to 60 in. diameter.

The packaged fans are available for volumes to 23,000 cfm at static pressures to 10 inches of water. They can be obtained with wheel diameters to 45⅛ in. and inlet diameters to 26 in.

Motor, V-belt drive, shaft, and bearings of the packaged units are mounted in a steel ventilated enclosure, one end of which is welded to the drive side plate supporting the housing shell. The outside end panel is removable for access to the interior. The driving motor is mounted on a universal support.

More information? Circle Item 16 on postcard, page 131.

Portable Hand Pump for Oil

A portable hand pump for dispensing oil to bearings, cutting tools, and pipe threading operations is made by Trico Fuse Mfg. Co., Milwaukee, Wis.

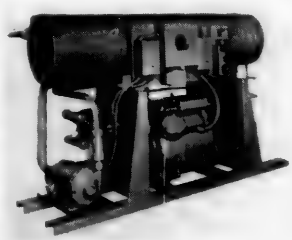
Oil is pumped through a flexible suction hose which is tapped directly to the gallon, or larger, container in which the oil is purchased. The need for transferring oil from one container to another is thereby eliminated. The large reserve oil supply also eliminates constant stoppages to refill small oil cans.

The pump dispenses oil in any direction or angle, making it suitable for hard-to-get-at locations. No air lines are needed, by it, and its nozzle is made of alloy steel to withstand possible damage through hard use.

More information? Circle Item 17 on postcard, page 131.

Packaged Liquid Chillers

Six packaged liquid chillers, called Flow-Cold and ranging in capacities from 3 to 20 tons are announced by Acme Industries, Inc., Jackson, Mich.



The chiller requires no cabinet or other special enclosure as sound-proofing. Its controls are engineered to match the chiller operation to the cooling load and provide protection against accidental freeze-up of the unit.

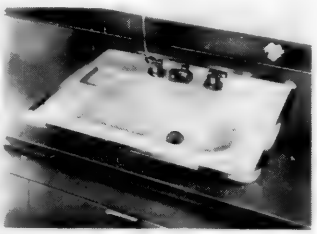
Each unit is shipped from the factory with the piping and wiring installed and tested, and is charged with the proper amount of refrigerant. Only the necessary connections to the condenser water supply, drain, chilled fluid lines, and electric supply line, are required to put the chiller into operation.

Instructions are furnished by the company with each unit, and engineering data on the chiller are given in catalog No. 50-D.

More information? Circle Item 18 on postcard, page 131.

Lavatory Is Made Larger

A larger Merrilyn lavatory, for installation in custom-built counter tops and cabinets, is added to the line of American-Standard plumbing products by Plumbing and Heating Div., American Radiator & Standard Sanitary Corp., Pittsburgh, Pa.



The flat rim lavatory measures 28 x 20 in. and is made of vitreous china. It is suitable for custom-built lavatory-dressing table arrangements in hotels and motels, as well as in private homes. The bowl includes such features as a front overflow, an anti-splash rim, and two cast-in soap dishes for washing convenience.

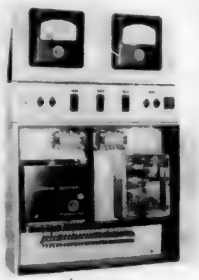
The lavatory comes complete with either the new Quality fittings of polished Chromard or the deluxe, satin-chrome Monogram fittings which may be engraved with the owner's initials.

A stainless steel frame with clamps, for mounting the lavatory, is available when specified. The lavatory is available in white and seven decorator colors.

More information? Circle Item 19 on postcard, page 131.

Burner Control Systems

Panel control systems named Fireye AC, for the automatic operation of commercial and industrial oil, gas, and combination oil-and-gas burners are announced by Combustion Control Div., Electronics Corporation of America, Boston, Mass.



A flame failure safeguard, programming control, short-circuit protection, motor starters, fuel selector switches, signals and alarms, are combined in a single, integrated panel unit that is prewired and tested before leaving the factory.

Optional equipment available in the panel assembly, includes sequence draft controls, draft and temperature indicators, and provision for switching to modulated, or fixed-rate firing.

The systems employ a flame-sensitive cell to visually monitor oil and gas flames. The systems automatically safeguard such stages of a burner's operation as: purging, proving the pilot, limiting trial-for-ignition to a safe period, and shutting off fuel within 2 to 4 sec if the flame goes out while firing.

More information? Circle Item 20 on postcard, page 131.

Commercial Thermostat

Temperature control in installations where dirt and humidity present a problem is the purpose of a commercial thermostat, the L-37, introduced by General Controls Co., Skokie, Ill.

Featuring a mercury switch, the thermostat has all its major components, including the sensitive bimetal element, case, and cover made of stainless steel.

Heavy duty, light duty, and millivolt models of the thermostat are available for general-purpose temperature control of heating, refrigeration, ventilation, and processing equipment. Its principal uses are in nurseries, poultry houses, garages, florists' cabinets, meat, fruit and vegetable walk-in coolers, ice houses, dryers and dehydrators, and with electric heaters, lamps and ventilating fans where humidity, insects, dirt, or limited atmospheric corrosion are factors.

The heavy duty model is supplied with dial lock and external adjustment knob. Light duty and millivolt models have external adjustment holes. The unit has two conduit knockouts for wiring from either top or bottom.

More information? Circle Item 21 on postcard, page 131.

Pressure Indicator-Controller

A static pressure indicator-controller (Model R-1051) with a pressure range as low as 0.0 to 0.2 inch of water is being produced by Johnson Service Co., Milwaukee, Wis.

Using a free floating, slack type diaphragm, the instrument is for the control of dampers and other devices for maintaining static or differential pressures. It can be used to control pressures above or below atmospheric, or for maintaining a constant differential between two pressures.

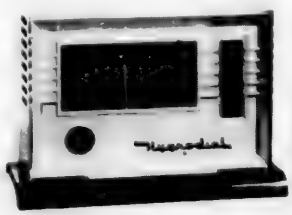
All instruments are available with calibrated dials for pressure ranges from 0.0 to 0.2, 0.3, 0.4, 0.5, 1.0 (illustrated), 2.0, 4.0, or 6.0 inches of water.

More information? Circle Item 22 on postcard, page 131.

Weather Indicator

A direct reading humidity and temperature indicator, called the Model No. 187 Hygrodial, is being produced by Abbeon Supply Co., Jamaica, N. Y.

The indicator is a direct reading instrument which shows the relative humidity and temperature of the air to which it is exposed. Its humidity scale is 2½ inches long and is graduated into divisions covering the range from 0 to 100% relative humidity. It contains a new type of hair element with a spring mechanism that allows the pointer to move across the face of the dial for comparatively rapid sensing of relative humidity changes. The temperature scale is 1½ in. high and covers a range of 0 to 110 deg F. It is accurate to within 1 deg at 70 deg and to within 3 deg at the extremes of the scale.



Overall dimensions of the indicator are 6 in. long, 4 in. high, and 2 17/32 in. deep. It has a base for standing on a desk or table and also a provision for wall mounting in a home or factory.

More information? Circle Item 23 on postcard, page 131.

Fittings Molded from Resin

Two new products made from chemically inert fluorocarbon resins are offered by Resistoflex Corp., Belleville, N. J.

The new products, a pipe elbow (illustrated) and a molded bellows, are recommended by the company for applications involving acids and caustics, foods and drugs, hot lacquers, steam, synthetic oils, jet fuels and gases, and vapors under extreme conditions of temperature.

Designated Fluoroflex-T, the pipe elbow has a short radius and is available in both 45- and 90-deg types. It is designed for use with Fluoroflex-T laminated pipe or any ASA flanged piping.

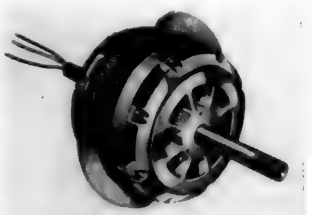
The molded bellows, called Fluoroflex-T1001, is a bellows and expansion joint that is chemically inert and may be obtained in 1, 1½, 2 and 3-in. diameters. Custom fabricated designs and shapes may also be ordered.

More information? Circle Item 24 on postcard, page 131.

Motor Fits In Blower

An integral drive motor for centrifugal blowers has been developed by Electronics Div., Iron Fireman Mfg. Co., Portland, Ore.

Designed for sale to blower manufacturers and the heating and air conditioning industry, the motor differs from conventional motors in that the rotating element, or rotor, is on the outside and revolves around a stationary shaft and field coil assembly. A flange on the rotor connects directly to the blower wheel, in effect making the motor an integral part of the wheel and eliminating the necessity for belts, pulleys, or special motor mounts.



The purpose of the motor's design is to increase the air delivery in relation to the size, weight, power input, and cost of the blower-motor combination.

Blower wheel and motor share a common shaft to form a single, integrated assembly centrally positioned within the scroll so that air flow is unrestricted at both ends of the blower. Both ends of the shaft are cradled in soft rubber to isolate noise and vibration. However, vibration is practically non-existent because the motor is so constructed that it can be dynamically balanced not only for mechanical imbalance, but also for electrical imbalance.

Only 6 in. in diameter (exclusive of the connecting flange) and 4½ in. in width, the motor does not add to the size of the blower. The blower-motor combination can be mounted in any position.

The motor itself is a permanent split capacitor type. Its speed automatically changes with variations in static pressure, which tends to compensate for the effects of dirty filters and other variables encountered in furnace and air conditioner applications. First production models are rated at ¼ hp and are designed to operate 9-in. blowers and some 10-in. blowers on 115-v, 60-cycle current.

More information? Circle Item 25 on postcard, page 131.

Packaged Air Conditioner

A packaged air conditioner has been designed for central duct systems in stores, suites of offices, and other large areas by Carrier Corp., Syracuse, N. Y.

Return air can be brought into the new unit in any of five ways: front, rear, sides, or through the bottom of the unit by means of a matching base accessory. In this way there are no holes to open on the sides and no return air openings to block off on the front. All wiring connections are made to a junction box at the side of the unit thereby making internal wiring unnecessary. The fan may be changed from top to rear discharge for installations with low head room.

Water-cooled, the packaged air conditioner is being manufactured in sizes of 2-, 3-, and 5-hp. A matched heating coil using any source of steam or hot water may be added inside the unit without need for modifications.

The company's 5-year dealer protection plan will apply to the new unit.

More information? Circle Item 26 on postcard, page 131.

Reversible Roof Ventilator

A reversible roof ventilator, which moves air in either direction, is being manufactured by Hartzell Propeller Fan Co., Piqua, Ohio.

Under normal exhaust conditions, the unit operates like any other roof ventilator, but at the flick of the switch it can be converted into an intake unit, pouring down cool outside air.

The roof ventilator is being made in 28, 36, and 44-in. sizes with a capacity range from 5500 to 23,600 cfm for exhaust (the range for intake operations is 5340 to 22,300 cfm). It can be supplied in all sizes for flat roof, slope roof, or peak installations.

Optional equipment, available at extra cost, includes wire mesh intake guards and motor- or manually-operated dampers.

The ventilator housing (illustrated with head swung open), with either the reversible fan or with the standard fan, meets the requirements for a blackout type roof ventilator.

Details on the reversible roof ventilator, including dimensions and air delivery data, are included in Bulletin A112-1.

More information? Circle Item 27 on postcard, page 131.

Process Cleans Air

A process, called Ultra-filtration, for cleaning atmospheric air with industrial-type air filtration equipment has been developed by Wheelabrator Corp., Mishawaka, Ind.

The process may be used in applications formerly employing disposable or viscous filters or low voltage electrostatic precipitators. Its advantages lie in a high cleaning efficiency and relative freedom from maintenance expense.

Employing conventional industrial dust collectors of the tubular cloth filter type, the process involves the charging of the filter bags with a filter aid which pre-coats the filtering surfaces and provides a matrix upon which the fine particles of atmospheric dust and tarry matter are collected. One application of the filter aid will last from two to three years under normal conditions. Since shaking the spent filter aid and accumulated dust from the filter bags comprises the only maintenance of the filter required, maintenance costs are limited to cleaning and recharging the collector.

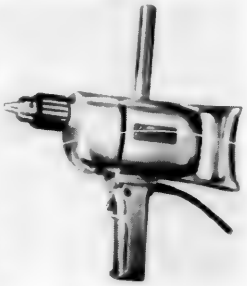
In one operating installation having a design volume of 720,000 cfm of city air, the process reduces the dust content of the air from 5.21 to 0.04 mgs per 1000 cu ft. The figures are average values over a period of one year.

The photo shows a unit installed at a sewage plant. The air capacity for this size collector ranges from 1644 to 2740 cfm.

More information? Circle Item 28 on postcard, page 131.

Half-Inch Power Drill

A ½-in. power drill, model 510, is being distributed by Power Tool Div., Dormeyer Corp., Chicago, Ill.



Equipped with a geared chuck, the drill has a multiple ball thrust bearing and self-lubricating bearings. Its capacity in steel is ½ in. and in hard wood 1 in.

Made of die cast aluminum alloy, the weight of the housing permits the drill to be handled in close quarters. A removable pipe handle provides control of the drill while in operation.

The drill's switch is spring-loaded for automatic shutoff and has a lock for sustained operation.

More information? Circle Item 29 on postcard, page 131.

Open-Type Compressors

A line of open-type refrigeration compressors is being produced by Brunner Mfg. Co., Utica, N. Y.

Known as the NR series, the compressor line is a series of basic pumps. It consists of three units, the NR-10, NR-20 and NR-30, for use with refrigeration condensing units in the 10 to 40-hp range. Their speed range is from 550 to 1070 rpm.

The valve service available on the NR models is a step towards standardization of parts for inter-changeability between various models. It means that wholesalers can standardize on about one-third the number of spare parts for valve plates, formerly required. Safety springs are incorporated in the discharge valve assembly.

In changing over the drive, the company has substituted a straight shaft with a keyway and removable hub for the former tapered shaft method of locking. The improved locking device facilitates assembly and disassembly and prevents the drive wheel from freezing to the shaft. Drive wheels have also been made smaller.

More information? Circle Item 30 on postcard, page 131.

Bronze Solder-End Valves

A line of five bronze solder-end valves is announced by Lunkenheimer Co., Cincinnati, Ohio.

The line includes three gate valves—one rising stem with double-wedge disc, a rising stem with solid-wedge disc, and a non-rising stem with single-wedge disc. All three are rated at 125 lb steam pressure and 200 lb water, oil, or gas.

The fourth valve is a bronze swing check valve with a renewable disc and side plugs; it carries the same pressure ratings as the first three. The line is completed by a non-metallic-disc globe valve, rated at 150 lb steam and 300 lb water, oil, and gas.

The valves are designed with plain ends for use with types K, L, and M copper tubing. Connections are made by soldering

The valves are suited for service in medical centers, hospitals, office buildings, schools, hotels, public buildings, stores, and large apartments, as well as for industrial applications. They are also recommended for use on plumbing, heating, and air conditioning lines; low pressure steam service; underground water lines; condensate return lines; liquor lines in breweries and distilleries; dye lines in textile mills, bleacheries, and dye houses; and similar services.

Ends are machined to assure proper flow of solder for a tight joint. In all other respects, the valves are identical with the corresponding figures to the company's screwed-end bronze valve series.

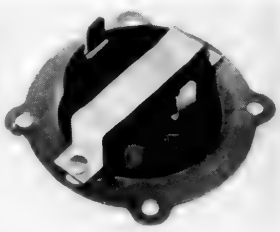
More information? Circle Item 31 on postcard, page 131.

Manufacturers' Representative

If you are seeking new lines, we suggest you register your name, territory covered, and present lines with this publication. We get numerous requests from manufacturers seeking representatives and by registering you pave the way to lining up desirable accounts. Write to the Editor, AIR CONDITIONING, HEATING AND VENTILATING, 93 Worth St., New York 13, N. Y.

Warm Air Duct Thermostat

A snap-action, bimetal disc thermostat for clothes dryers, furnace ducts, and other warm-air applications is announced by Stevens Mfg. Co., Inc., Lexington and Mansfield, Ohio.



Designated as the Stemco Type D thermostat, the unit is approved by the Underwriters Laboratories for operation to 300 deg F. It is rated at 25 amp, 120-240v a-c, noninductive.

Two basic styles are available: either exposed bimetal or enclosed bimetal. The former responds somewhat more rapidly, while the latter is suitable for use in atmospheres having a high lint or dust content. Each basic style is supplied either with two or four holes for mounting and with either spade type terminals or with No. 8-32 screw type terminals.

The bimetal thermal element and the contact mechanism are in separate compartments in order to lessen the possibility of dirt depositing on the contacts and to insure that the arc blast will in no way affect the operating temperatures.

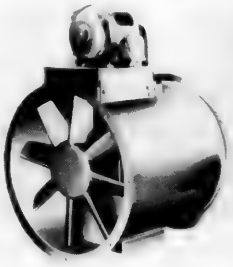
Engineering and performance data on the thermostats are available.

More information? Circle Item 32 on postcard, page 131.

Fans Are Redesigned

A line of axial airfoil fans, Type L, has been redesigned by Chicago Blower Corp., Franklin Park, Ill.

Streamline contours have been given to all surfaces that contact the air stream. The hub is contoured and formed to approximate the motor diameters and varies from 25% to 70% from the wheel diameters. This eliminates turbulence over the motor and back flow.



Blade angles are large at the hub and decrease to small values at the tip to produce an even distribution of air velocity from hub to tip, without dead spots. They are wider than standard designs.

Wheels of 2, 4, 6, and 8 blades are available for various pressure and volume requirements.

Eight models are made to meet different types of ventilating needs under a variety of conditions. They include fans with direct and V-belt drives. Fourteen different wheels from 12 to 72 in. in diameter are manufactured and, in all, 502 models are cataloged to meet various requirements. Wheels are available in alloys which are capable of resisting corrosion or high temperatures.

The fans can be supplied with six different types of acid resistant coatings that are able to meet acid or corrosive fume conditions. The coatings can be applied to all surfaces of the fan, both inside and out, or only to the wheel, shaft, and housing interior.

Automatic fan louvers are used in conjunction with wall mounting installations to protect the propeller fan and the interior of the building from rain and snow. All bearings are placed inside the frame and are not exposed to the weather. They can be furnished either automatic air operated, manual, or motor operated.

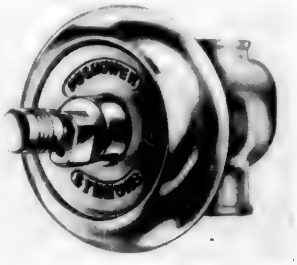
The fans deliver from 1240 to 102,000 cfm in sizes ranging from 12 to 72 in. with static pressures from $\frac{1}{8}$ to $3\frac{1}{2}$ in.

More information? Circle Item 33 on postcard, page 131.

Automatic Shower Limiter

A valve has been designed to be used solely as an automatic shutoff valve for showers by Symmons Engineering Co., Boston, Mass.

Trade named Pushower, the automatic valve reduces the amount of water used for a shower to an average of 10 to 15 gallons per shower. When tempered water is used there is an added savings in smaller hot water requirements.



The valve works on a piston principle which uses the water pressure in the line itself to open and close the valve. The first push of the button gives a full flow for about 25 to 40 seconds, after which the water automatically shuts off. The bather may then take his time to lather. A second push provides another interval of full flow for rinsing. Continuous flow can be maintained by pressing the button at shorter intervals than a full flow cycle.

Oversize piping is not required for the valve's installation. It will function on supply lines down to $\frac{3}{8}$-in. in diameter.

More information? Circle Item 34 on postcard, page 131.

New Line of Refrigerants

Plans to enter the refrigerant field with a family of chlorofluorohydrocarbon refrigerants, to be called the Isotrone line, are announced by Pennsylvania Salt Mfg. Co., Philadelphia, Pa. The line will be available late in 1956.

Initial products will include trichloromonofluoromethane, dichlorodifluoromethane, and monochlorodifluoromethane. Early additions to the line will be trichlorofluoroethane and dichlorotetrafluoroethane.

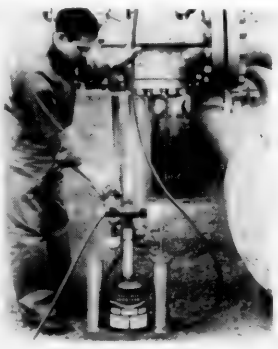
This expansion is part of Pennsalt's long-range plans for consolidating its established position in the fluorine chemicals industry and to achieve further product diversification. The new Isotron line will be produced in a multimillion dollar plant already under construction at Calvert City, Kentucky.

The refrigerants have been assigned to the Industrial Chemicals Division, and are expected soon to contribute to an important part of its total sales volume. Technical services to customers will play a major role in marketing plans for the Isotron products.

More information? Circle Item 35 on postcard, page 131.

Self-Priming Valve Lubricator

A lightweight, air-operated, lubricating gun, designed to meet field and plant maintenance needs, is introduced by Meter and Valve Div., Rockwell Mfg. Co., Pittsburgh, Pa.



Described as self-priming, the plug valve lubricant gun (called Hypregun) weighs 39 lb and operates on air pressures up to 150 psi. It is recommended especially for large-scale valve lubricating in refineries, compressor stations, gasoline plants, cycling plants, pipelines, and Christmas tree installations.

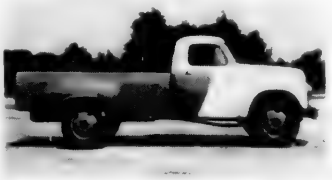
An air motor and double piston provide the self-priming action, which is a feature of the new gun.

The unit uses Rockwell-Nordstrom 5-qt lubricant cans, which are loaded directly into the gun to eliminate manual handling of lubricant or changing lubricant from one container to another.

More information? Circle Item 36 on postcard, page 131.

One-Ton Pickup Truck

A 1-ton truck (Model 2E13 illustrated) with a 9-ft pickup body is one of the models of the 1956 line of Transtar trucks announced by Studebaker-Packard Corp., South Bend, Ind. It will be available with single or dual rear tires and a 156-hp, V8 engine.



Engineering changes in the line include an electric shift with a two-speed rear axle, increases up to 700 lb in gross vehicle weight on pickup models, 12-v electrical systems, wide tread rear axle, larger capacity brakes and springs, two-stage springs as standard equipment, and acoustical sound deadening headlinings.

In the light duty line, wheelbases of 112, 122, and 131 in. will be available with gross vehicle weights ranging from 4800 lb in the ½-ton model to 9600 lb in the 1-ton model. Four engines will be offered: a 92-hp, 185.6 cu in. in-line engine; 140-hp or 160-hp 224.3 cu in. V8 engines; and a 156-hp 259.2 cu in. V8 engine. Pickup bodies will be 6½ to 9 ft in length, stake and platform types 8 and 9 ft.

The heavier duty line, with a range of gross vehicle weight from 14,000 to 16,000 lb, will include 131 in., 155 in. and 171 in. wheelbases. Both the 1½ and 2-ton models will use the 259.6 cu in. 156-hp engine, and for the 2-ton, only, a 175-hp engine will be available.

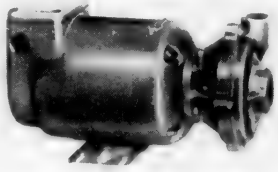
Safety features include instrument panel crash pads, optional crash-tested seat belts, full-width rear window, foot-controlled fresh air ducts, enclosed cab steps, and non-glare instrument panels.

There will be six single-tone colors for the line and three two-tone combinations for the pickup models.

More information? Circle Item 37 on postcard, page 131.

Small Centrifugal Pump

A 1/20-hp Rumaco centrifugal pump, Model D-500, has been developed and placed in production by the Ruthman Machinery Co., Cincinnati, Ohio.



Equipped with a self-adjusting seal, the unit is designed for use in closed, semi-closed, or open systems and can be mounted at any convenient point, either in a horizontal, vertical, or angular position, without restricting the high level line of the liquid in the reservoir. The direction of discharge is interchangeable in four 90-deg positions.

The pump is available in either cast iron or bronze.

A one-piece motor shaft, which rotates on two ball-bearings, extends through the seal to the pump housing, in which no bearings are employed.

More information? Circle Item 38 on postcard, page 131.

Fractional Hp Motors

A line of all-purpose fractional horsepower electric motors designed for do-it-yourself fans, farmers, and light industrial shops is introduced by Emerson Electric Mfg. Co., St. Louis, Mo. Distribution of the new line, which bears the trade name Multi-Duti, will be made through electrical wholesalers and dealers.

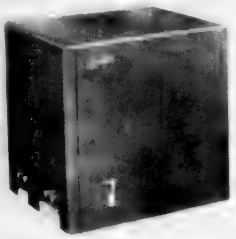
There are 18 types of motors in the line, ranging from ¼-horsepower to 1 horsepower, in sleeve and ball-bearing construction. They are split phase and capacitor-start motors, and the various models have a speed rating of either 1725 or 3500 rpm.

More information? Circle Item 39 on postcard, page 131.

Residential Water Chiller

A package water chiller has been designed for residential air conditioning and small commercial-industrial applications by Acme Industries, Inc., Jackson, Mich.

Called Flow-Pac, the unit consists of an hermetically sealed compressor with a vertical chiller and a vertical condenser. It is suitable for use with chilled water convectors or with water coils in central air handling systems. The cabinet is available as an optional enclosure.



Added to the company's WCW series with water-cooled condensers, the water chiller is available in 1¾, 3, and 5-hp sizes with nominal heat transfer ratings of 20,000, 36,000, and 63,000 Btu per hr, respectively. The WCA series of 2, 3, and 5-hp models are made with an air-cooled condenser unit for remote mounting.

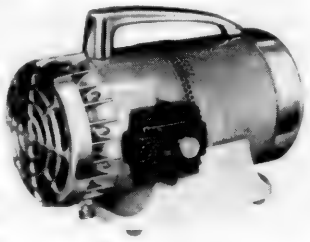
The units are factory tested and shipped with a charge of Freon-22 and are ready for operation after connection to the power supply and the system's piping.

More information? Circle Item 40 on postcard, page 131.

Portable Air Compressor

A small and compact air compressor is being manufactured by Bell & Gossett Co., Morton Grove, Ill.

Equipped with specially constructed graphite or carbon piston rings instead of conventional steel piston rings, the compressor does not use oil. The carbon serves as a dry lubricant, and the unit does not require oil separators, strainers, or filters to provide oil-free air.



For the plumbing, heating, and refrigeration industries, the compressor is useful for paint spraying a completed piping job, to pressure testing piping systems for leaks, and it is adaptable to pneumatic tools, such as caulking hammers and star drills. It may also be converted to operate as a vacuum pump.

In industry, the compressor's uses include: pumping liquids, spraying, sand blasting, operating grease guns, pneumatic temperature control systems and pneumatic tools; agitating, elevating and transferring acids, chemicals and other solutions, and operating dry sprinkler systems, air brake switches, and signal systems.

Spray guns furnished with the compressor outfits are of the external mix type. They need not be dismantled for cleaning and are adjustable for coarse or fine spray in various patterns.

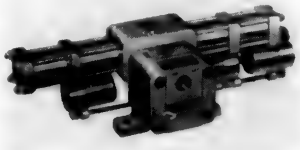
The compressors are rated for continuous operation at 35, 75, and 175 lb; horsepower ranges from ¼ to ¾.

More information? Circle Item 41 on postcard, page 131.

Three-Position Valve

A power operated valve (Model PON) featuring operation to forward, reverse, and neutral is available from Ledeen Mfg. Co., Los Angeles, Calif. It is a standard 4-way disc valve for air, gas, oil, or water service controlled by a 3-position power attachment operated by air or gas.

Designed for remote control and automatic operation, the valve has a rotating disc construction. It has a molybdenum alloy, semi-steel body for freedom from body leaks and a chrome-plated surface in the body for smooth action. An integral disc and stem provide rigidity and durability. Both the body and disc are lapped to optical accuracy to obtain a good seal.



The valve is illustrated and described in Bulletin 1010, which lists the operating cycles, flow cycles, dimensions and weights, circuit diagrams, and parts and accessories.

More information? Circle Item 42 on postcard, page 131.

Jet Pump Moves Solids

A line of jet pumps, designed to transport solids through pipelines, is announced by The Allen-Sherman-Hoff Co., Wynnewood, Pa.

Known as the Hydro-Ejector, the pump is available in four sizes, for 4, 6, 8, and 10-in. transport pipelines.

Because the jet nozzle tip is located out of the path of the materials being handled, it cannot interfere with the free flow of solids. The unit is installed in a watertight housing with an access door, an observation window, and an emergency flow connection which encloses the feed hopper and the discharge opening of the storage hopper. This prevents flooding of the operating floor during over-feeding or when draining the storage hoppers.

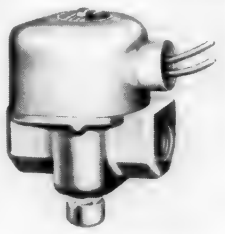
Iron pyrites can be transported in the same system that conveys bottom ash or furnace slag. This combined operation uses the greater specific gravity of a water-and-ash mixture to carry the heavy pyrites at a higher rate.

Wear on the unit is minimized by the use of wear resistant materials, the use of few connecting joints within the unit, and by locating the jet water nozzle tip out of the path of the material being transported. The pump can be equipped with special gaskets to withstand the effects of acids, alkalis, and high temperatures.

More information? Circle Item 43 on postcard, page 131.

Gas Valve Has Manual Opener

Gas valves (Series 925-926) with an optional manual opening device are placed on the automatic control market by Penn Controls, Inc., Goshen, Ind. The manual opener permits the operation of a gas furnace or appliance even though the electric power supply may be temporarily disrupted.



Currently available on the ½- and ¾-in. gas valves, the manual opening device consists of a knob, located at the bottom of the valve, which may be operated to open the valve whenever a situation such as a no power condition or temporary interruption calls for it. The valves are returned to automatic operation when desired by turning the knob to the *unlatch* position.

The ½- and ¾-in. valves provide gas capacities of 267,000 and 366,000 Btu per hr, respectively.

More information? Circle Item 44 on postcard, page 131.

Leak Detector

A quality control instrument, designed to detect leaks in sealed compressor units, condenser and evaporative coils, and valves, is offered by Beckman Div., Beckman Instruments, Inc., Fullerton, Calif.

The leak detector is a mass spectrometer that identifies gases by their molecular weight. The instrument is tuned to respond only to helium—a safe, inert, sampling gas with a fast instrument response.

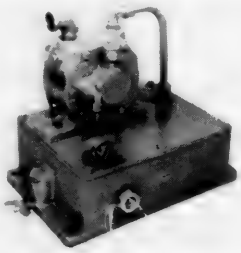
In the operation of the instrument, helium is introduced into the system or component to be tested or sprayed over the system's surface. If there is a leak, the helium will be detected by the leak detector, which is sensitive up to one part of helium in 700,000 parts of air. Audible and visible warnings pinpoint the location of the leak.

More information? Circle Item 45 on postcard, page 131.

Vacuum Pump Is Redesigned

A reduction in height and an increase in vacuum in its line of straight wing rotary air pumps are announced by Leiman Bros., Inc., Newark, N. J.

Redesigned by the company, the pumps have had their overall height reduced by 33% and the vacuum increased to as low as 0.4 mm of mercury, absolute. The improvements were gained by a newly designed automatic oiling system which is placed under the pump instead of on the top of the pump, as with the old system. The redesign and saving in space have been accomplished without any change in the length of the steel wings, the area of the piston space, or the efficiency of the automatic wing adjuster in the pump itself.



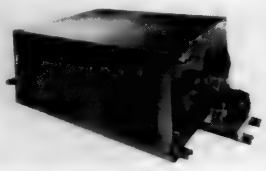
Ranging in capacities from 2.4 to 40 cfm, the pumps provide a range of 15 to 20 psig when used for pressure. The new dimensions of the pump are being issued by the manufacturer.

More information? Circle Item 46 on postcard, page 131.

Electric Defrost Coolers

Electrically defrosted unit coolers are produced by Refrigeration Appliances, Inc., Chicago, Ill., for sharp freezing systems, locker systems, ice cream hardening rooms, and other operations. The units are automatic and bear the trade name Krack.

Defrosting is accomplished through heat supplied by electric heaters. The defrosting cycle is commenced by a time clock, which energizes the motor, which in turn closes the door of the unit. At the same time, the solenoid located in the refrigerant liquid line is closed, thereby stopping the refrigeration cycle. When the unit door approaches its closing stages, a mercury switch makes contact, energizing the heater circuit. When the door is completely closed, the defrosting cycle is in full operation with warm air being continuously recirculated within the unit by the centrifugal fans. A limit thermostat inside the unit prevents overheating.



When the defrosting cycle is terminated the timer once again energizes the motor which opens the door. The heaters are deenergized, the liquid line solenoid opens, and the refrigeration cycle is resumed. For manual control a single pole, double throw switch replaces the timer.

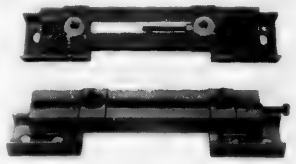
Six models of the electric defrost unit cooler are designed for use with Freon, ammonia, and brine. Basic rated cooling capacities with Freon and ammonia range from 1000 to 4760 Btu per hr at a 1-deg temperature difference. Capacities with brine can be obtained from factory, and the units move from 1868 to 7100 cfm.

More information? Circle Item 47 on postcard, page 131.

Motor Base Has Slide Rails

A motor base with a slide mechanism for adjusting drive belt tension has been developed by The Korfund Co., Inc., Long Island City, N. Y. The base was developed by the company to combine the conventional system of a vibration and noise isolation base with a separate slide base or slide rails.

The patented design of the twin, angle iron rails assures sufficient structural rigidity while permitting adjustments of a motor for rapid equipment installation. The design also permits the slide mechanism to be located within the base rather than on top of it.



Top and side views of one motor isolation slide rail are shown in the illustration. Two individual rails, with adjusting bolts at opposite ends to facilitate installation, constitute a set. In a completed installation, the adjusting bolts do not protrude, so that there are no exposed, hazardous parts. The base accommodates twenty-nine different motor sizes with only six standard base sizes.

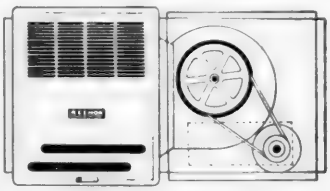
More information? Circle Item 48 on postcard, page 131.

Duct Furnace Accessories

Accessories to allow the conversion of small capacity duct furnaces into complete, automatic heating units are available from Reznor Mfg. Co., Mercer, Pa.

The accessories added are those most commonly used in duct systems, plus those necessary to adapt the furnace for use as a deluxe unit heater without ducts. The accessory list includes blowers, a blower enclosure which can also be used as a plenum chamber, louver ends, a filter case, and thermostats for 24- or 115-volt control systems.

The basic duct furnace, D Series, is a gas-fired heat exchanger with a full complement of combustion controls, all within a cabinet. It is available in 50, 75, 100, and 125,000 Btu per hr capacities. It is designed to be used as the heart of a duct heating or cooling system.



The blowers are of the centrifugal type, with 9-in. wheels. Variable speed motor pulleys provide adjustment for the air flow (cfm). Because air flow through the heater may be in either direction, the blower may be mounted on either end of the furnace.

The blower enclosure is a cube consisting of three solid panels and one access panel interchangeable in position for blower housing or plenum chamber arrangements.

The filter case, with flanges matching those on the blower enclosure and on the duct furnace, accommodates one 20 x 20-in. standard filter.

The louver end consists of four adjustable louvers in a steel frame which can be mounted on the furnace or duct end, with the louvers in either a vertical or horizontal position.

More information? Circle Item 49 on postcard, page 131.

Commercial Air Conditioner

A combination heating and cooling unit for installation in hotels, office buildings, and hospitals is made by Mueller Climatrol, Milwaukee, Wis. The room-type air conditioner has a self-contained, air-cooled cooling unit with a built-in heating coil which operates off the central steam or hot water system. Because the unit is installed through the wall, it is known as the Type 920 recessed air conditioner.

Designed to replace the radiators in existing buildings, the unit measures 30 in. high, 32½ in. wide, and protrudes into the room 15½ in. An opening is cut through the exterior wall for installing the outside louver frame flush to the outside wall. This single access to the outside serves the dual purpose of supplying fresh air for air cooling at the condenser and for discharging the warmed, humid air leaving the condenser.

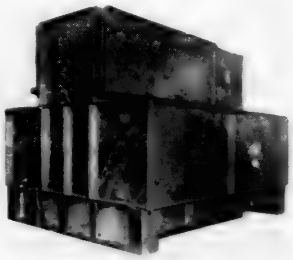
Controls on the new unit are concealed but accessible. They include a push button selector switch and integral heating and cooling thermostat.

More information? Circle Item 50 on postcard, page 131.

Refrigerant Condenser

An evaporative-type refrigerant condenser, in capacities ranging up to 240 tons of ammonia refrigeration, is announced by Niagara Blower Co., New York, N. Y.

Refrigerant is condensed in two parallel mounted coils enclosing a central plenum under the fan section. Water sprays are arranged over the coils and the air enters from above, travels downward, and changes direction to enter the plenum, at which point the entrained water is eliminated. The air then moves up and out through propeller fans.



Hot gas is sub-cooled before condensation by first passing through double pass, pre-cooling coils mounted beside the fan section. A dry air stream crosses this coil, removing the superheat. Any oil vapor present is liquefied during this process and removed by a separator in the gas line ahead of the condensing coils. This pre-cooling also prevents the high-temperature deposit of hard scale on the condensing coils.

There are four sizes: 90, 120, 180, and 240 tons. The ratings are for ammonia; the condensers are also applicable to Freon. The dimensions of the largest size are approximately: length 13 ft, width 16 ft and height 10½ ft.

More information? Circle Item 51 on postcard, page 131.

Line of Plastic Pipe

A line of rigid polyvinyl chloride pipe is available from National Tube Div., United States Steel Co., Pittsburgh, Pa.

The company extrudes the unplasticized polyvinyl chloride into pipe of two types—normal and high impact. The normal impact type is intended for installations requiring a high degree of chemical resistance together with high strength and creep properties. The high impact type is suitable for installations requiring good chemical resistance and a high degree of toughness at low temperatures.

In addition to its resistance to attack by acids, alkalies, salt solution, and alcohols, the pipe is nontoxic and will not impart foreign tastes or odors to liquids used for human consumption. Its rigidity allows it to be used for overhead piping installations with pipe supports. Also, Schedule 80 pipe may be threaded with steel threading dies. Twenty feet of 2-in. standard pipe weighs less than 13 lb.

The company also manufactures flexible plastic pipe for applications such as water lines, irrigation, mine drainage, lines in food plants and sewer lines.

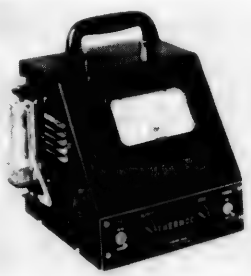
A 28-page catalog, Bulletin 24, lists the physical properties of the rigid polyvinyl chloride pipe as well as its resistance to chemicals.

More information? Circle Item 52 on postcard, page 131.

Portable Flue Gas Analyzer

A new model portable instrument for measuring the carbon dioxide in flue gas is offered by Thermco Laboratories, Michigan City, Ind.

Designated Model 4, the instrument has a range from 0 to 20% carbon dioxide with a 2% meter. The case measures 8 x 8 x 8 in., and the entire instrument weighs 12 lb.



Operating on 115v, 60 cycles, the analyzer gives a continuous reading of the flue gas composition so that an operator can adjust a furnace and immediately see the results of the adjustment. The analyzer draws a sample of gas from the flue and properly conditions it through a filter and flow indicator. The sample of gas then passes through a pump and into a thermal conductivity analyzer cell which electrically detects the carbon dioxide. The output of the cell is measured on a meter that shows the percent carbon dioxide in the flue.

More information? Circle Item 53 on postcard, page 131.

Hypodermic Needle Gage

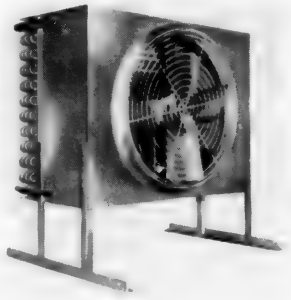
A pressure gage for determining available air pressure at the point of use is introduced by U. S. Gauge, Div., American Machine and Metals, Inc., Sellersville, Pa.

The 2-in. diameter gage is finished in chrome and comes equipped with a BD-20 hypodermic needle and guard. It permits tapping the air hose at the tool, thus determining pressure available at the tool regardless of the original pressure or number of tools on the line.

More information? Circle Item 54 on postcard, page 131.

Air-Cooled Condensers

Air cooled condensers are being manufactured by Halstead & Mitchell, Pittsburgh, Pa.



Made in sizes from 2 to 20 tons, the units are designed for use with air conditioning systems where water is unavailable, water costs are high, or disposal of surplus water is a problem. They may also be used where it is desired to eliminate hot compressor rooms, or where an existing system requires extra condenser capacity. Many of the units are used where a combined air-and-water cooled system is feasible.

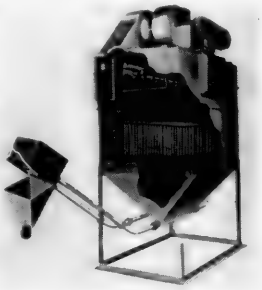
The condenser cabinets are fabricated of heavy gage sheet steel, protected by coatings of vinsynite, vinyl zinc, and chlorinated rubber to provide a flexible water barrier. The coils are available with both aluminum and copper fins.

The condensers may be mounted on either the floor or ceiling and are designed for multiple circuit operation. Wind deflectors are available with them for outside applications, where necessary, to insure rated capacity with varying wind conditions.

More information? Circle Item 55 on postcard, page 131.

Scrubber Cleans Exhaust Gases

A dust control unit that removes microscopic solids, fumes, and odors from exhaust has been developed by The Johnson-March Corp., Philadelphia, Pa. It can be used anywhere impurities are encountered of low and submicron size particles.



Known as the Type A Hydro precipitator scrubber, the unit collects dust by hydrocompressing exhaust gases through a system of multiple tubes into a water chamber. The water agitation set up causes secondary pressure turbulence and additional scrubbing action in the tube chamber.

The scrubber comes in fifteen sizes for capacities ranging between 500 cfm and 40,000 cfm. Sludge can be removed constantly or intermittently by manual, hydraulic, or mechanical means.

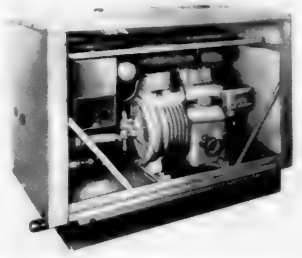
With basic variations for size, the scrubber consists essentially of a rectangular shaped housing containing a plenum chamber, a multiple-tube section, water tank underneath the housing, a de-watering filter and an exhaust fan mounted on top of the housing. When required, it can be built with special metals or plastic materials for service with corrosive or toxic gases.

The nine smallest models are furnished completely assembled; the six larger units are supplied in two or three sections to facilitate shipping and handling.

More information? Circle Item 56 on postcard, page 131.

Chiller Has Removable Panels

A packaged water and liquid chiller for air conditioning and industrial applications is being produced by American Coils Co., Newark, N. J., in an improved type of insulated cabinet.



Available in sizes ranging from 3 to 15 hp, the packaged chiller (Model AC.) is housed in a heavy sheet metal, bonderized, hammertone finished, tan and mocha cabinet. Panels making up the four sides and top of the cabinet are removable, making all component parts of the unit accessible for cleaning and servicing.

Air conditioning applications of the unit include installations in hotels, motels, apartments, homes and places where heating or cooling with water is required or desirable. In industry chiller will cool press rollers and dye processes, chill plastic and rubber molds and computing equipment, and perform other necessary cooling functions required by high speed machinery.

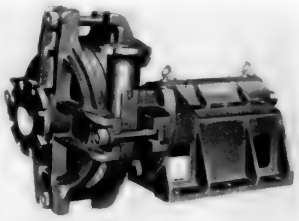
The larger models are designed to permit zone cooling. The 10 and 15 hp sizes are built with two complete refrigeration and chiller systems of equal ratings. The systems may be hooked up individually or in parallel. Individual selector switches that operate the two separate circuits permit the cooling of a part of an over-all cooling load, as well as an entire zoned installation.

More information? Circle Item 57 on postcard, page 131.

Heavy Duty Slurry Pump

A heavy duty suction pump, designated Type Q, is added to its line of slurry pumps by Morris Machine Works, Baldwinsville, N. Y.

A low speed, continuous duty pump, the unit is designed to handle abrasive slurries of cement, sand, coal, solids, chemical sludges, and other products up to the maximum fluid consistency under suction lift or positive head. It is available in seven different models from a 2- to 6-in. size.



By removing four bolts, the pump can be opened for most maintenance requirements without disturbing the piping. Interchangeable liners on both sides of the impeller puts the wear on replaceable parts, and the rotating element is adjustable to take up for wear.

External vanes on both sides of the impeller prevent packing between the impeller and casing. The impeller is pressure balanced to prevent recirculation and is threaded to the shaft and sealed against corrosive action.

More information? Circle Item 58 on postcard, page 131.

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Snow Melted in Park and Garage

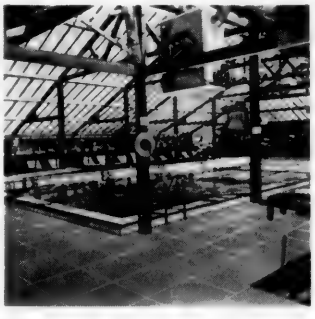
PROBLEM: For construction of the Mellon Square Park and Garage in Pittsburgh, it was desired to equip walks and garage ramps approaching the underground parking area with snow melting systems.

SOLUTION: Four miles of concealed wrought iron piping, product of A. M. Byers Co., were installed in snow melting systems serving exposed steps, walks and driveway ramps of both park and garage. The park occupies a city block of landscaped area atop the garage which consists of six levels of parking space below the ground level. Snow melting coils are laid on 12 inches of concrete slab and embedded in an additional surfacing of approximately five inches of concrete.

RESULTS: While the snow melting system in walks and steps is primarily a winter safety accommodation for pedestrians passing through the park, the driveway ramp installations play a functional role in solving Pittsburgh's acute traffic congestion problem. Snow melting installed in driveway facilities assures skidfree access to the garage in the most severe winter weather.

Unit Heaters Warm Swimming Solarium

PROBLEM: Faced with the problem of keeping its swimming solarium comfortable the year-round, Wagon Wheel Lodge, a luxury motel in Rockford, Ill., tried several methods of heating. Although they were able to warm the air, swimmers complained of chill when emerging from the pool. The solarium is a huge glass enclosure, and radiant losses in winter are considerable.



SOLUTION: Four Delta oil-fired unit heaters were installed. Heaters, manufactured by the Delta Heating Corp., of Trenton, N. J., were suspended overhead so as to direct the flow of warm air horizontally, with some deflection of air to lower levels.

RESULTS: Swimmers reported the solarium to be comfortable with the new heating system. Costs were low in comparison to other systems and no steam or water lines were required. The motel is now able to operate the pool throughout the year.

Air Cooled Condensers Serve Market

PROBLEM: Upkeep of cooling towers and evaporative condensers required so many hours of work annually for maintenance crews of the Paxton Wholesale Grocery Co., of Champaign, Ill., that some method had to be found to minimize such expenses.

SOLUTION: All super markets in the chain were equipped with Kramer Trenton Unicorn air cooled condensers. Typically, all condensing on the air conditioning system, open dairy cases, vegetable cases, meat, fish and poultry cases and walk-in coolers at Paxton's market in Champaign are equipped with Unicon condensers. In all, the complete market installation requires the use of seven units, five of which are equipped with Kramer Trenton winter controls. All the condensers are mounted on the store roof and are equipped with standard motor hoods and floor stands. All units that operate during the winter months are equipped with the Kramer patented Winterstat winter control valve.

RESULTS: Savings in water bills and maintenance work through use of air cooled condensers have spurred the company to insist on nothing but air cooled condensers.

Plane Delivery Speeds Emergency Repair

PROBLEM: An unusual occurrence resulted in the damaging of a condenser on an air conditioning unit used in the operating room of St. Luke's Hospital in Cleveland, Ohio. A quick check showed that the condenser was a Halstead & Mitchell unit and that it would be necessary to pick up a completely new condenser at the factory at Zelienople, Penna.

SOLUTION: Elmer Wiedwald, president of Cleveland Hermetic and Supply Inc., took off in the company's Piper Tri-Pacer. The plane was forced down by a severe thunder storm en route, but took off again after the storm and arrived at the Zelienople landing strip where they were met by a crew from Halstead & Mitchell. In a very short time the plane was loaded with a replacement condenser and the return trip to Cleveland was made without incident.

RESULTS: A dramatic plane race prevented a critical situation from developing in the hospital operating room.

Room Cooler Speeds Photo Production

PROBLEM: Summer months are picture taking months for many people, and the summer load of busines at Commercial Photos, Inc., Dayton, Ohio subjected employees working in confined quarters to discomfort at a time when they were trying to keep abreast of extremely heavy schedules in photo printing laboratories.

SOLUTION: The firm recently equipped each of its photo printing laboratories with a window-type air conditioner manufactured by Chrysler Airtemp. Conditioners were installed through side walls owing to the absence of windows in darkrooms

RESULTS: In addition to added comfort of employees, it was found that air conditioning materially aids quality control. Negatives are kept dust free and procesing chemicals are maintained at an even temperature. It was thus possible to turn out more prints in less time than previously required and the quality of prints was more uniform. Exhaust feature of the conditioners removes chemical odors from the laboratories.

Split-Levels Get Even Heat

PROBLEM: In split-level houses it has been notoriously difficult to maintain comfortable temperatures in basement playrooms without overheating the upper levels owing to open construction and convection currents.

SOLUTION: Two Long Island building firms, Thomas Wolfson and Gus Tarlow of South Oaks Homes, Inc. and J. M. Beauleau of Melba Park Homes, are obtaining controlled temperatures in all rooms at a comfortable level with a difference of no more than 4 degrees by using Electronic Moduflow, manufactured by Minneapolis - Honeywell Regulator Co. The system forces heating plants to keep hot water pipes and warm air ducts constantly warm. This is accomplished by constantly turning the heating source on and off rather than permitting it to heat for long stretches and then idle for long periods. When it is necessary to heat for long periods to bring the temperature back to normal, the living area on the second level and the bedrooms on the third level become overheated. With the Moduflow system room temperatures reach the desired level and are maintained by a steady supply of heat. Tests were made during several cold stretches last winter and temperatures were recorded for several 24-hour periods at points inside and outside the homes

RESULTS: Typical were two series of tests conducted January 2nd and 3rd at the South Oaks Homes. Both days registered about 6 degree days, minimum outside temperatures were 21 and 20 deg F and thermostats were set at 72 deg on both days. Without Moduflow the temperature difference between lower and upper levels was as much as 8 degrees. With Moduflow, even temperatures were maintained.

Air Conditioning Aids Precision Boring

PROBLEM: In the Dornson Corp., a metal parts manufacturing firm located in Los Angeles, stable temperatures were needed for the operation of the firm's jig borer, which operates at 00 tolerances under a two degree range of temperature. Expansion and contraction of metal parts had an adverse affect upon close tolerances. Variations of .0008 were noted over a 15 degree temperature range.

SOLUTION: It was decided to air condition the Dornson plant in order to maintain stable temperatures necessary to precise machining. Although the plant is located less than three miles from the Pacific ocean and is therefore in the coastal cool zone, air conditioning was nevertheless required to maintain the proper temperature conditions. A Typhoon 20 ton packaged air conditioning unit was installed as a ducted central station system with grilles located at critical spots throughout the plant. The office area is also air conditioned by the same unit. Office conditions are controlled at a temperature slightly higher than plant area conditions by a thermostat controlled damper.

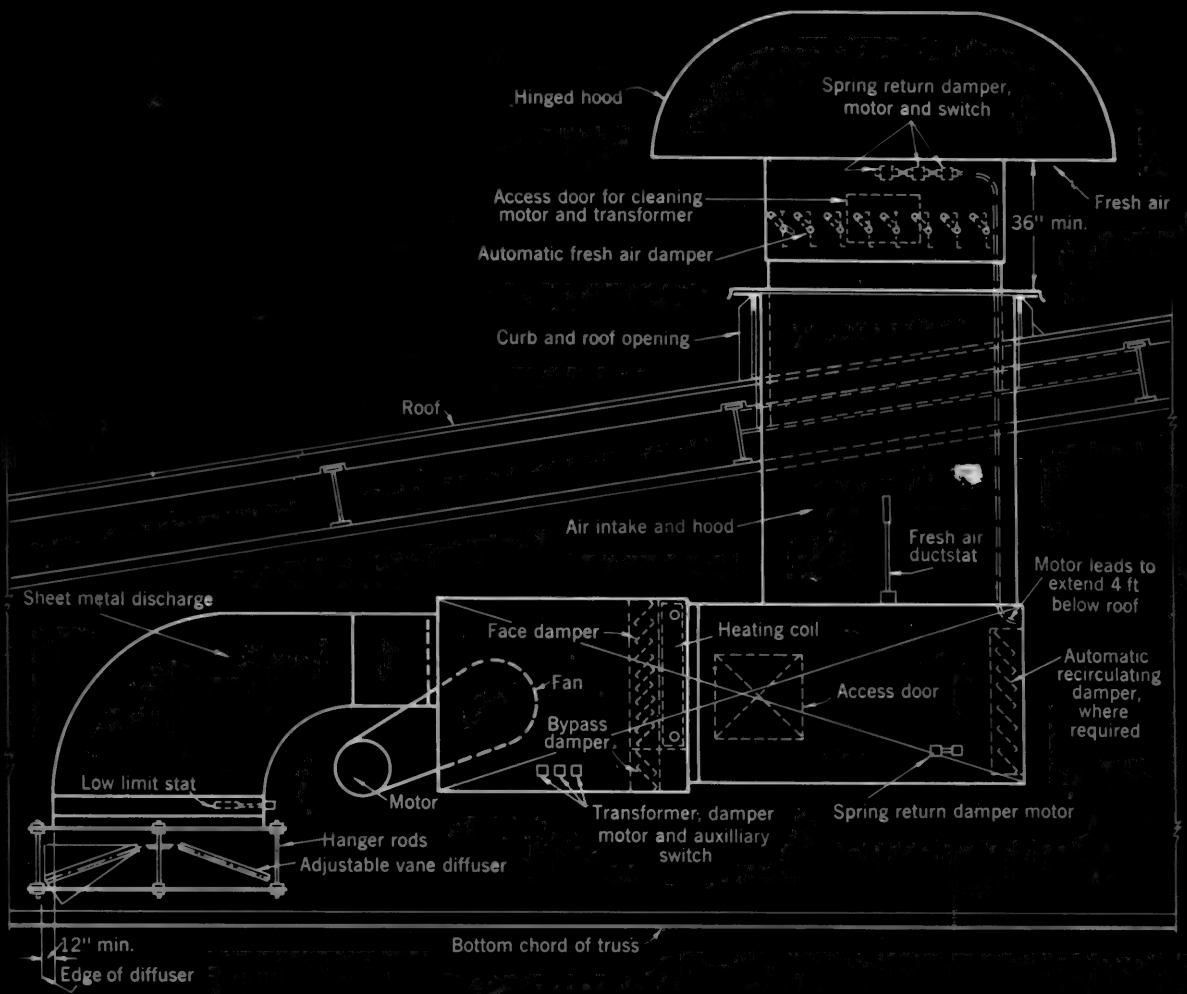
RESULTS: With the installation of air conditioning, problems of metal expansion and contraction were eliminated. Employees also are pleased at the comfortable conditions.

Radiant Heaters Warm Drive-In

The Fiesta Drive-In Restaurant in Milwaukee, Wis., becomes the first drive-in restaurant located in the cold zone of America now equipped to operate on a year 'round basis. The owner has installed a Perfection Infra Rayhead gas heater above each of the 50 car bays.

Perfection Industries, Inc., Cleveland, Ohio, is licensed to manufacture and distribute these new heaters under the Schwank German patents.

WINTER SUPPLY AIR UNIT



WINTER SUPPLY AIR UNIT WITH RECIRCULATING DAMPER

SEQUENCE OF OPERATION FOR FRESH AIR UNITS

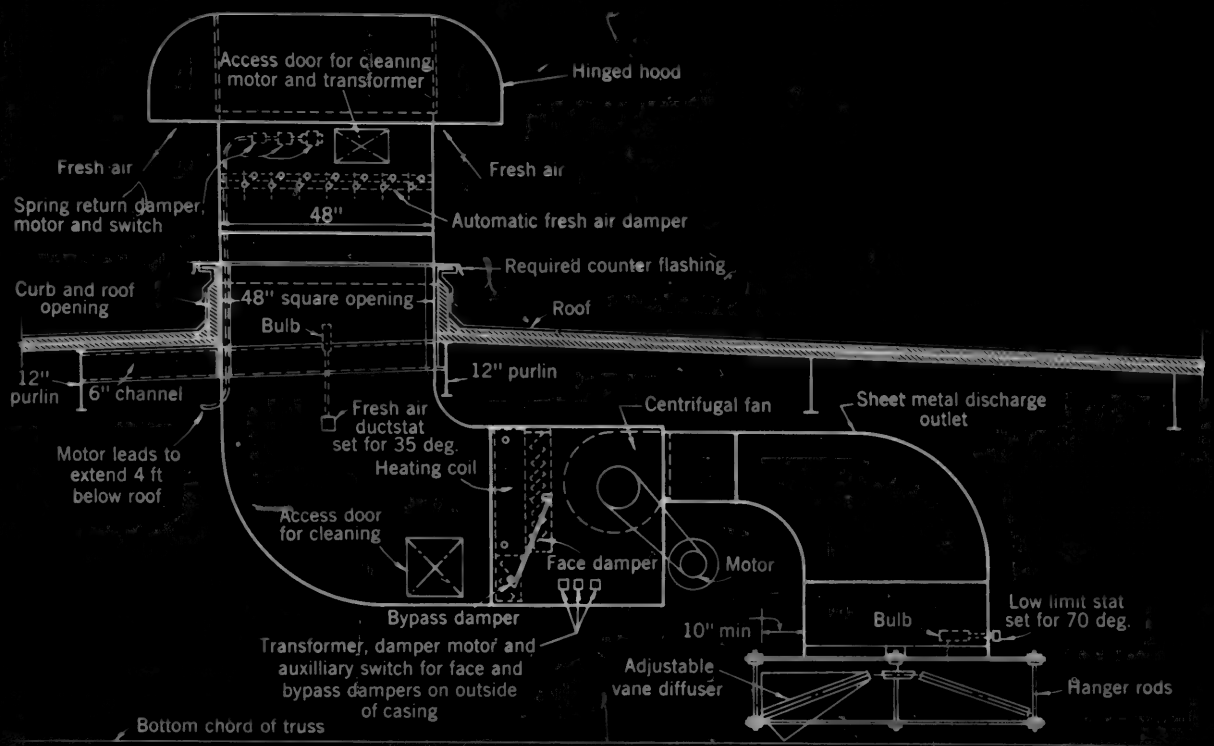
When the fan motor is started, the damper motor on the fresh air damper will be energized and keeps the dampers open as long as the fan is running. When the fan is stopped, the damper motor is de-energized and the spring return closes the damper.

The room thermostat maintains the desired temperature by modulating the motor on the face and bypass damper, which in turn modulates the steam valve through the dual switch. The fresh air duct stat opens the steam valve wide regardless of the setting of the room thermostat or the low limit stat whenever the outside temperature is below 35 deg. F. The low limit stat overrides the room thermostat to maintain a minimum discharge temperature of 70 deg. whenever necessary.

With the recirculating units, when the fan motor is started and the transfer switch is in the recirculating position, the damper motor on the recirculation dampers will keep the dampers open as long as the fan is running. When the fan is stopped, the spring return closes the damper.

CUT ALONG THIS LINE

WINTER SUPPLY AIR UNIT



SEQUENCE OF OPERATION FOR FRESH AIR UNITS

When the fan motor is started, the damper motor on the fresh air damper will be energized and keeps the dampers open as long as the fan is running. When the fan is stopped, the damper motor is de-energized and the spring return closes the damper.

The room thermostat maintains the desired temperature by modulating the motor on the face and bypass damper, which in turn modulates the steam valve through the dual switch. The fresh air duct stat opens the steam valve wide regardless of the setting of the room thermostat or the low limit stat whenever the outside temperature is below 35 deg F. The low limit stat overrides the room thermostat to maintain a minimum discharge temperature of 70 deg. whenever necessary.

Although drawing covers a standard unit, a 48 in. by 48 in. square opening through the roof is used for units with capacities of 10,000, 15,000, 20,000 and 25,000 cfm.

DRAWINGS THROUGH THE COOPERATION OF
ALBERT KAHN ASSOCIATED ARCHITECTS AND ENGINEERS, INC.

350-HOUSE BRISTOL PARK TRACT, Santa Ana, California

"Foot for foot, pound for pound, nothing installs as economically as COPPER WATER TUBE,"

Says GARY STICE
Earl O. Stice Co., Mechanical Contractors, Glendale, Calif.

Said Mr. Stice, "Whether or not codes call for copper when imbedding plumbing and heating lines or radiant panel heating coils in a concrete slab I play it safe and use copper anyhow. For with non-rusting copper, moisture and seepage are never a problem.

"And, as far as installation is concerned, fewer joints are necessary with copper water tube. Then, too, you can always be sure that the few solder joints that you do make are tight . . . a mighty important item when you're imbedding in concrete. So with all these advantages of copper water tube you can see why I have found it the most economical material to install."

You will find Revere Copper Water Tube installs economically when used for plumbing lines, radiant panel heating, air conditioning, underground service lines, waste, stack and vent lines, processing lines.

And if you want to know the short cuts, or have installation problems, involving Revere Copper Water Tube, let us know and we'll put you in touch with our Technical Advisory Service.

REVERE

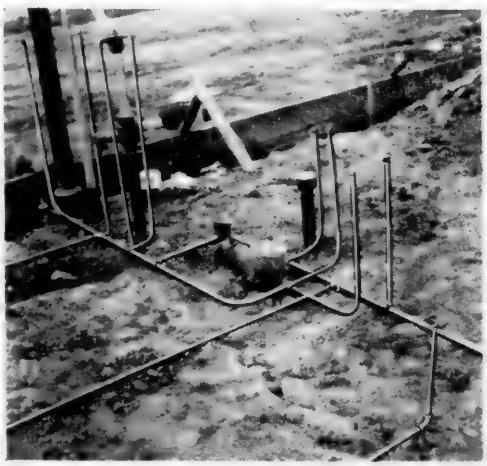
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

ONE OF THE HUNDRED completed homes shown in the large aerial view above. There will eventually be 350 homes in this tract. 34,000 feet of enduring Revere Copper Water Tube have already been installed in the first hundred homes in ½", ¾" and 1" sizes. Bldr. and Gen. Cont.: M. J. BROCK & SONS, INC., Los Angeles, Calif. Revere Dist.: KEENAN PIPE & SUPPLY COMPANY, Los Angeles, Calif.



NON-RUSTING REVERE COPPER WATER TUBE before imbedding in the concrete slab.

BOOK REVIEWS

(*Concluded from page 93*)

BUILDING CONSTRUCTION AND EQUIPMENT

Standards of the National Fire Protection Association in the field of building construction and equipment are contained in Building Construction and Equipment, 1955 edition. Although much of the information in this volume may be found useful in the drafting and application of building codes, this should not be considered a building code.

It is suggested by the association that the standards in the book should be applied with due recognition of the fact that safe building construction and equipment may not be the answer to any individual fire problem and that the control of fire hazards, extinguishing and alarm equipment, and other features covered in other National Fire Codes should receive consideration.

The National Fire Codes, a compilation of 172 fire safety standards developed by the NFPA, has been published as a six-volume set. This book is Vol. III of this set and covers the following features:

Protection of openings in walls and partitions; protection against exposure fires; incinerators; rubbish handling; garages; air conditioning systems; warm air heating and air conditioning for residences; blower and exhaust systems; building exits; nursing homes; interior finish; places of outdoor assembly; hotel fire safety law, structural defects, and roof openings.

Building Construction and Equipment, containing 33 NFPA standards. Cloth bound, 5½ x 8½ inches, 672 pages. Published by the National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass. Price, $6.

PERFORMANCE OF THREE TYPES OF INDIRECT WATER HEATERS—In homes using steam or hot water as the heating medium, it is common practice to supply hot water for domestic use by means of an indirect water heater attached to the house heating boiler. Since there was only meager data on such water heaters, an extensive research program was started in 1942 and a bulletin issued at that time. Bulletin 432 covers tests on domestic hot water heaters made since then. Heaters tested were in conjunction with the gas-fired house heating boiler in the I-B-R research home. The Engineering Experiment Station, University of Illinois, Urbana, Ill. Price, 75 cents.

MULTIPLE V-BELT DRIVE STANDARDS—A 24-page manual on Engineering Standards Multiple V-Belt Drives has been issued by the Multiple V-Belt Drive and Mechanical Power Transmission Association, and the Rubber Manufacturers' Association, Inc. Data in the manual are based on the latest engineering opinion and research. It indicates the proper sheaves and belts to be used for the attainment of optimum efficiency and economy. It shows ratings of belt speeds from 200 to 6000 fpm. Rubber Manufacturers' Association, Inc., 444 Madison Ave., New York 22, N. Y. Price, $1.

BUTT-WELDING ENDS—The American Society of Mechanical Engineers and two other engineering groups are sponsors for ASA B16.25-1955 on Butt-Welding Ends for Pipes, Valves, Flanges and Fittings. This standard covers the preparation of butt-welding ends of pipe, valves, welding neck flanges, and pipe fittings. It can be applied equally as well to other piping components which are connected into the system by butt-welding. American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, $1.

HEAT LOSS CALCULATION GUIDE—The I-B-R Calculation Guide for Heat Loss, No. H-20, is published to provide a procedure which can be easily followed for accurate calculation of the heat losses of a residential type building. The presentation of information is made so that one can readily use the data, regardless of previous experience or technical education. The calculation of heat losses consists of six steps, each one fully explained. Included are valuable tables and a special sheet to simplify calculations. Institute of Boiler and Radiator Manufacturers, 608 Fifth Ave., New York 20, N. Y. Price, 75 cents.

NATURAL GAS STATISTICS—A large amount of statistical data and graphs are presented in this publication compiled by Richard C. Henshaw, Jr., Statistician, Bureau of Business Research, The University of Texas. It is a supplement to Research Monograph No. 15 on Economics of Natural Gas in Texas. Bureau of Business Research, The University of Texas, Austin, Tex. Price, $2.

AIR CONDITIONING DESIGN—Findings of studies conducted under American Gas Association Domestic Gas Research Project DGR-2-AC, are incorporated in a Manual for the Design of Extended Plenum Type Air Conditioning Duct Systems. It was prepared as an aid in the practical design and field application of that system. The design procedure applies to residential and small commercial air conditioning systems. American Gas Association, 420 Lexington Ave., New York 17, N. Y. Price, $1.

REVIEW OF CURRENT RESEARCH AND DIRECTORY OF MEMBER INSTITUTIONS—Material is so arranged to show the various research projects being carried on at various colleges. There is also an index of research with references to the colleges where such studies are being conducted. This book is published biennially by the Engineering College Research Council of the American Society for Engineering Education. This paper bound book of 352 pages lists about 7500 research projects. Renato Contini, secretary, Engineering College Research Council, New York University, University Heights, New York 53, N. Y. Price, $2.

HYGIENIC GUIDES—A series of special information bulletins termed Hygienic Guides is being issued by the American Industrial Hygiene Association. Each guide will have information on maximum allowable concentration for both short and long term exposures, significant chemical and physical properties, major uses, evaluation of exposures, engineering control procedures, medical control procedures, and a reference to the literature. Guides are now available for acetaldehyde, cadmium, carbon tetrachloride, butyl alcohol (N-Butanol) and amyl acetate. American Industrial Hygiene Association, 14125 Prevost, Detroit 27, Mich. Price, 25 cents each.

THE ONLY Matched

COOLING TOWERS and CONDENSERS

The Halstead & Mitchell Cooling Towers you select are *matched* by design to work with the famous Halstead & Mitchell water-cooled Condensers. You need no longer buy a high-efficiency cooling tower to work with a low-efficiency condenser (or *vice-versa*) . . . a long-life cooling tower to work with a short-life condenser (or *vice-versa*).

Remember that every cooling tower you sell is planned to work with a water-cooled condenser—then you'll see why America's leading manufacturers of air-conditioning and refrigeration equipment have swung to Halstead & Mitchell for their original equipment needs in both these components.

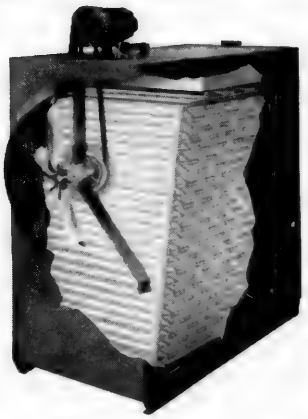
With cleanability you'll sell more. Why sell less?

20-Year Guarantee!

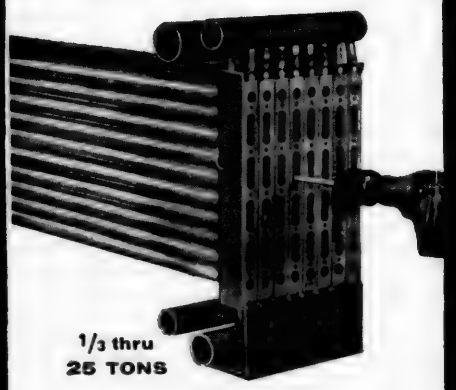
on the wetted deck surface against rotting or fungus attack

Only Halstead & Mitchell pressure-creosoting can provide a *guarantee* against immediate attack by fungus and marine parasites . . . or chemical deterioration from acids in water.

Added to this H&M exclusive are other major advantages. There's ultra-high efficiency in the gravity-type water distributing pan which eliminates extra pumping head required on spray type towers . . . and cuts down on water losses due to "atomizing" of water. And there's extra-long life in stainless steel fans . . . and sheet steel cabinets hydraulically painted with vinsynite, vinyl zinc and chlorinated rubber.



2 thru 120 TONS



1/3 thru 25 TONS

Lifetime Cleanability

The *mechanical* cleaning of H&M double-tube, counter-flow condensers means the simplest, least dangerous method of restoring new unit efficiency. Whether removing a heavy coating of sludge and scale, or a thin insulating film on the inner walls of the copper tubing, the mechanical cleaning tool restores heat transfer efficiency in a matter of minutes. The result is lowered discharge pressures . . . more heat carried off by cooling water . . . lower bills. *Only* the impurities are removed . . . the thickness of the copper wall remains intact, and the condenser gives extra years of peak service.

At Leading Heating and Refrigeration Wholesalers *EVERYWHERE*

Write for Detailed Specifications

Halstead & Mitchell

BESSEMER BUILDING • PITTSBURGH 22, PA.

DEGREE-DAYS FOR NOVEMBER, 1955

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

AIR CONDITIONING, HEATING AND VENTILATING'S 28th Year of Publication of Monthly Degree-Day Data

City	November			Season to November 30, incl.*		
	1955	1954	Normal	1955-56	1954-55	Normal
Abilene, Texas (A)	374	275	350	450	374	503
Albany, New York (A)	821	752	780	1382	1264	1362
Albuquerque, New Mexico (A)	590	483	630	728	637	858
Alpena, Michigan (C)	942	770	864	1590	1464	1609
Anaconda, Montana (C)	(a)	704	951**	(a)	1668	1933**
Asheville, North Carolina (C)	605	653	552	888	964	864
Atlanta, Georgia (A)	433	460	393	571	605	511
Atlantic City, New Jersey (C)	557	539	507	739	732	766
Augusta, Georgia (A)	396	419	282	534	562	341
Baltimore, Maryland (C)	600	529	489	791	708	725
Billings, Montana (A)	1224	626	876	1831	1318	1567
Binghamton, New York (C)	793	727	735	1268	1200	1304
Birmingham, Alabama (A)	450	418	396	635	576	532
Bismarck, North Dakota (A)	1494	850	1098	2247	727	1923
Block Island, Rhode Island (A)	629	572	591	964	895	1009
Boise, Idaho (A)	875	636	762	1430	1212	1286
Boston, Massachusetts (A)	685	612	618	1077	967	1010
Bozeman, Montana (C)	(a)	724	1006**	(a)	1637	1993**
Buffalo, New York (A)	788	693	753	1262	1182	1308
Burlington, Iowa (A)	919	682	765	1314	1105	1184
Burlington, Vermont (A)	878	799	858	1542	1450	1551
Butte, Montana (C)	(a)	765	923**	(a)	1776	1922**
Cairo, Illinois (C)	564	466	492	750	679	681
Charleston, South Carolina (C)	225	254	214	267	322	248
Charlotte, North Carolina (A)	442	438	366	598	592	508
Chattanooga, Tennessee (A)	536	528	477	766	736	670
Cheyenne, Wyoming (A)	1035	736	897	1726	1403	1715
Chicago, Illinois (C)	811	629	696**	1109	960	1098**
Cincinnati, Ohio (C)	648	540	567	860	801	831
Cleveland, Ohio (A)	785	663	699	1157	1036	1114
Columbia, Missouri (A)	742	561	654	1012	863	978
Columbia, South Carolina (A)	380	438	308	511	575	384
Columbus, Ohio (C)	747	616	654	1068	924	1012
Concord, New Hampshire (A)	857	802	849	1569	1446	1568
Concordia, Kansas (C)	818	523	687	1114	832	1019
Dallas, Texas (A)	347	263	299	401	341	352
Dayton, Ohio (A)	793	680	693	1137	1051	1090
Deer Lodge, Montana (C)	(a)	765	1055**	(a)	1856	2187**
Denver, Colorado (A)	857	616	771	1319	1082	1316
Des Moines, Iowa (A)	1008	669	798	1425	1118	1252
Detroit, Michigan (A)	811	705	747	1208	1126	1224
Devils Lake, North Dakota (C)	1520	944	1197	2436	1933	2127
Dodge City, Kansas (A)	765	498	669	1018	812	971
Dubuque, Iowa (A)	1015	795	882	1544	1363	1475
Duluth, Minnesota (C)	1273	962	1092	2164	1991	1983
Elkins, West Virginia (A)	825	774	726	1310	1288	1260
El Paso, Texas (A)	317	308	390	351	354	460
Ely, Nevada (A)	994	781	894	1799	1614	1683
Escanaba, Michigan (C)	995	793	933	1676	1604	1735
Evansville, Indiana (A)	682	567	570	946	872	844
Fargo, North Dakota	1376	906	1122	2141	1771	1923
Fort Smith, Arkansas (A)	502	394	435	647	543	575
Fort Wayne, Indiana (A)	861	720	759	1259	1144	1243
Fort Worth, Texas (A)	356	276	299	411	353	357
Fresno, California (A)	426	372	345	480	454	431
Galveston, Texas (C)	148	80	131	152	99	131
Grand Junction, Colorado (A)	888	669	792	1200	1018	1161
Grand Rapids, Michigan (A)	886	746	822	1372	1273	1428
Green Bay, Wisconsin (A)	1028	847	945	1689	1587	1643
Greensboro, North Carolina (A)	538	607	510	780	841	741
Greenville, South Carolina (A)	442	510	411	605	676	552
Harrisburg, Pennsylvania (A)	718	670	630	1042	991	1007
Hartford, Connecticut (A)	754	706	699	1190	1145	1184
Hatteras, North Carolina (C)	287	269	244	336	327	307
Havre, Montana (C)	1539	676	1023	2364	1481	1857
Helena, Montana (A)	1355	772	999	2217	1744	2217
Houston, Texas (C)	196	119	162	217	149	162
Huron, South Dakota (A)	1269	761	975	1886	1431	1596
Indianapolis, Indiana (A)	820	682	705	1171	1055	1090
Jackson, Mississippi (A)	385	321	310	520	437	379
Kansas City, Missouri (A)	740	478	621	940	732	905
Knoxville, Tennessee (A)	567	563	498	788	779	710
La Crosse, Wisconsin (A)	1057	803	921	1585	1423	1520

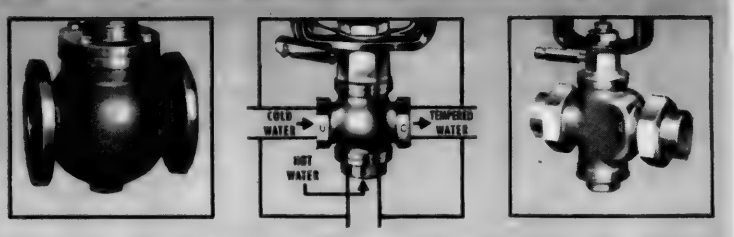
(a) Data not available.
*Heating season, cumulative, from Sept. 1.
**Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with eight exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company. Tacoma figures through the courtesy of the Tacoma News Tribune.

[Table concluded on page 116]

POWERS No. 11 Self-Operating TEMPERATURE REGULATOR

Automatically holds temperature constant at the right point. Prevents losses caused by wasteful OVER-heating.

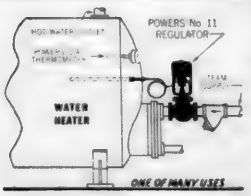


Various Valve Bodies and Inner Valves are available. Single and Double Seat Valves thru 2" have rugged bronze bodies with bronze union connections for quick, easy installation. Bulletin 329 gives information about all types.

(c22)

Why It Gives
BETTER CONTROL
and Saves More Money

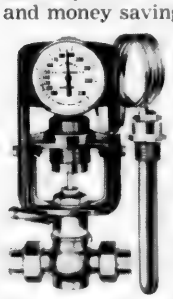
Often repays its cost 3 to 6 times a year when used on:



Water Heaters
—
Industrial Processes
—
Heat Exchangers
—
Fuel and Crude Oil Heaters
—
Air Compressors Diesel Engines

ONLY POWERS No. 11 REGULATOR
Offers ALL These Advantages

- **Simple, sturdy construction.** Materials used are corrosion resistant.
- **Powers bellows has 50% more power** than used in the majority of regulators. The heart of a self operating regulator is its bellows. Powers with its 50% greater effective area gives better control and its durable 2 ply bellows outlasts ordinary single ply bellows.
- **Valve stem lubricator** with silicone grease aids easy movement of highly polished stainless steel valve stem and reduces drying out of packing.
- **BETTER CONTROL** results from Powers powerful bellows and minimum of valve stem friction.
- **60°F. temperature ranges** available with accuracy of ±1°F. on some processes and 2 to 3°F. on others.
- **Rugged bronze valve bodies with bronze union connections,** for single and double seat valves thru 2", reduce installation time and labor. Larger sizes have flanged iron body valves.
- **Powers Nationwide Service and 24 Hour Delivery** in the U.S.A. are important time and money saving advantages.



- **Indicating Regulator** with easy to read 4" dial thermometer helps adjust the regulator and check temperature at the bulb. Various dials and ranges are available.

Right type and size of valve is important for good control. May we help you make the right selection? Benefit from POWERS more than 60 years experience with self-operating regulators.

Call our nearest office or write us direct for Bulletin 329.

THE POWERS REGULATOR CO.

Skokie, Ill. | Offices in Chief Cities in U.S.A.
Canada and Mexico | See your phone book

Automatic Temperature and Humidity Control

Established 1891

Degree-Days for November, 1955 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 28th Year of Publication of Monthly Degree-Day Data

City	November			Season to November 30, incl.*		
	1955	1954	Normal	1955-56	1954-55	Normal
Lander, Wyoming (A)	1138	772	1050	1834	1519	1926
Lewiston, Maine (O)	788	825	876	1464	1514	1542
Lincoln, Nebraska (C)	914	589	741	1246	973	1130
Little Rock, Arkansas (A)	461	362	405	585	504	525
Livingston, Montana (C)	(a)	667	864**	(a)	1600	1614**
Los Angeles, California (C)	144	81	140	208	111	198
Louisville, Kentucky (A)	653	559	579	887	852	862
Lynchburg, Virginia (A)	595	630	531	859	895	816
Macon, Georgia (A)	345	360	280	460	474	343
Madison, Wisconsin (C)	974	782	864	1487	1321	1420
Marquette, Michigan (C)	1026	808	933	1762	1689	1712
Memphis, Tennessee (A)	487	431	432	645	595	575
Meridian, Mississippi (A)	398	350	338	548	485	428
Milwaukee, Wisconsin (A)	939	736	831	1416	1223	1393
Minneapolis, Minnesota (A)	1173	795	960	1732	1483	1576
Moline, Illinois (A)	914	722	786	1341	1175	1245
Montgomery, Alabama (A)	354	360	304	486	467	373
Nantucket, Massachusetts (A)	(a)	568	615	(a)	957	1098
Nashville, Tennessee (A)	574	498	471	788	728	647
New Haven, Connecticut (A)	695	651	663	1078	1042	1119
New Orleans, Louisiana (C)	189	150	141	203	183	146
New York, New York (C)	627	569	561	839	826	863
Newark, New Jersey (A)	639	601	603	888	888	951
Norfolk, Virginia (A)	411	442	408	533	591	569
North Platte, Nebraska (A)	1063	737	846	1652	1312	1391
Oak Ridge, Tennessee (C)	610	599	550	877	845	775
Oakland, California (A)	353	282	336	638	476	569
Oklahoma City, Oklahoma (A)	595	392	459	751	545	620
Omaha, Nebraska (A)	964	575	783	1334	970	1202
Parkersburg, West Virginia (C)	665	630	600	951	961	928
Peoria, Illinois (A)	873	689	759	1245	1069	1184
Philadelphia, Pennsylvania (C)	551	554	516	723	770	768
Phoenix, Arizona (A)	181	39	182	182	53	195
Pittsburgh, Pennsylvania (C)	693	615	612	998	939	966
Pittsfield, Mass. (A)	887	826	843	1602	1488	1599
Pocatello, Idaho (A)	960	739	873	1652	1488	1543
Portland, Maine (A)	861	785	825	1608	1464	1539
Portland, Oregon (C)	656	397	534	1044	779	899
Providence, Rhode Island (A)	711	658	672	1153	1060	1160
Pueblo, Colorado (A)	804	609	771	1143	978	1228
Raleigh, North Carolina (A)	500	530	387	696	732	515
Rapid City, South Dakota (A)	1203	665	891	1802	1337	1584
Reading, Pennsylvania (C)	657	630	588	926	918	930
Red Bluff, California (A)	395	364	319	445	438	378
Reno, Nevada (A)	762	700	744	1398	1387	1352
Richmond, Virginia (A)	555	561	498	750	786	741
Rochester, New York (A)	812	701	759	1337	1217	1332
Roswell, New Mexico (A)	500	437	501	634	607	665
Sacramento, California (C)	361	378	321	417	459	413
St. Joseph, Missouri (A)	863	566	600	1167	878	882
St. Louis, Missouri (C)	650	521	570	868	790	810
Salt Lake City, Utah (A)	873	622	771	1367	1114	1240
San Antonio, Texas (A)	222	142	201	250	171	226
San Diego, California (A)	154	64	147	209	99	223
Sandusky, Ohio (C)	(a)	670	684	(a)	1004	1077
San Francisco, California (C)	273	245	237	630	477	475
Sault Ste. Marie, Michigan (A)	1049	858	1005	1900	1802	1942
Savannah, Georgia (A)	283	328	225	370	435	263
Scranton, Pennsylvania (A)	813	702	693	1286	1139	1197
Seattle, Washington (C)	708	404	540	1245	882	1003
Sheridan, Wyoming (A)	1238	693	957	1914	1450	1774
Shreveport, Louisiana (A)	351	285	305	430	366	358
Sioux City, Iowa (A)	1078	661	885	1515	1170	1418
Spokane, Washington (A)	1101	696	879	1888	1496	1592
Springfield, Illinois (A)	806	658	666	1151	1023	981
Springfield, Missouri (A)	695	529	615	948	808	925
Syracuse, New York (A)	790	717	714	1272	1186	1227
Tacoma, Washington (C)	709	428	579	1264	932	1131
Toledo, Ohio (A)	843	717	756	1282	1149	1245
Topeka, Kansas (C)	771	487	630	1006	755	913
Trenton, New Jersey (C)	633	611	582	892	900	922
Tulsa, Oklahoma (A)	560	367	462	689	502	632
Utica, New York (O)	834	757	781**	1347	1313	1393**
Valentine, Nebraska (A)	1162	691	891	1748	1337	1497
Walla Walla, Washington (C)	891	464	675	1335	930	1076
Washington, D. C. (C)	573	567	510	755	793	773
Wichita, Kansas (A)	718	467	597	933	693	848
Williston, North Dakota (C)	1497	776	1101	2294	1683	1967
Winnemucca, Nevada (A)	921	766	822	1641	1565	1510
Yakima, Washington (A)	1008	635	807	1692	1336	1403

For footnotes, see page 114.

Now Herman Nelson brings you years-ahead features in a new "packaged" Unit Blower!

Save time, make specifying easier with ready-to-install Unit Blowers

A Complete Package — And easy to install! You can select a unit to suit your *exact* needs in moments. No separate base layout is needed for motor and fan; no V-belt drive has to be installed and aligned; no separate belt guard or weather protection need be fabricated and installed. No separate parts to figure.

So Easy To Service — For routine servicing, Herman Nelson Unit Blowers are the most *accessible* blowers you can specify or buy. Hinged weather cover always fits; outboard sheave eliminates need for bearing removal when belts replaced. Adjustable motor mounting may be adjusted up or down, or side to side – quickly.

Compact, Space-Saving — You save valuable floor space – can install a trim unit in spaces where more cumbersome equipment would not fit. Weatherproof cover may even be opened vertically where space is limited.

Wide Range of Unit Sizes — Choose from capacities of 370 cfm to 25,000 cfm. New, advanced design models to handle supply and exhaust installations in schools, hospitals, stores, industrial plants, chemical laboratories – anywhere you have a blower application.

Forwardly Curved and Backward Inclined Wheels — Weatherproof cover and belt guard • Inlet side pedestal (all models 12" up) • Statically and dynamically balanced wheels • Sturdy housings are Bonderite finished to resist rust and corrosion.

Write for . . . new catalog on Herman Nelson Unit Blowers. Get *all* the facts on ready-to-install "packaged" units designed to simplify your specifying job, save time in installation. Remember, better air is our business, our *only* business for more than thirty years. Address American Air Filter Co., Inc., 294 Central Ave., Louisville 8, Ky.

AAF herman nelson

American Air Filter
COMPANY, INC.
General Offices, Louisville, Ky.
Plants in Louisville, Moline (Ill.), Morrison (Ill.), Chicago and Montreal (Canada)

Better Air Is Our Business

UNIT HEATERS

INDUSTRIAL HEATERS

CENTRIFUGAL FANS

INDUSTRIAL EXHAUSTERS

NEWS OF THE MONTH

BOILER FOR NAVY

is a prototype unit for program to standardize packaged boilers for the generation of heat and steam.

As part of a standardization program started after the war, the U. S. Navy will shortly receive delivery of a prototype packaged boiler. The boilers design will set the Navy standards for factory assembled units of this type in capacities ranging from 10,000 to 25,000 lb of steam per hr.

In the Spring of 1948 a superficial survey of the Navy's facilities for the generation of heat and steam revealed a lack of standardization in general arrangement, in design factors, in maintenance and operational procedures, and inadequacies in metering and control equipment. Some of the plants of larger capacity had been built primarily for coal fuel but, because of disturbances in the labor market affecting the availability of coal, had also been equipped for oil fuel.

The prototype boiler to be received by the Navy is now undergoing factory testing by its builder, Superior Combustion Industries, Inc. It has a capacity of 12,500 lb of steam per hr, and is designed primarily for firing coal, with a provision for changeover to oil or gas. It is equipped with Riley Stoker Co.'s vibrating grate, mechanical ash discharge, and spreader stokers.

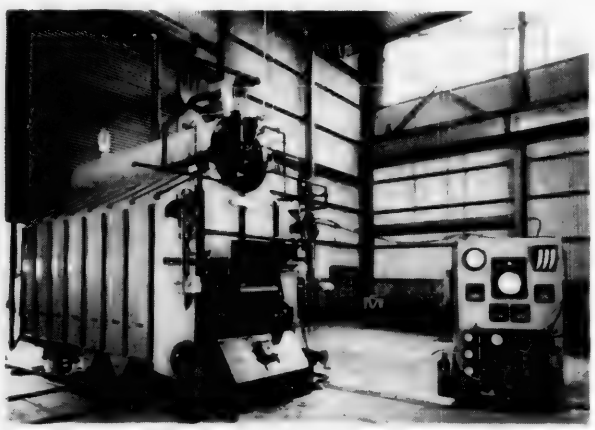
• **DESIGN.**—Among the important design features of this boiler is the elimination of the high refractory base previously employed for small capacity, packaged water tube, oil or gas-fired steam generators when converted for coal firing. The base for this packaged boiler is 15 in. high, and the boiler chill line extends to the grate level.

The boiler tube arrangement is of the basic A-type, and the conversion from solid to liquid or gaseous fuels may be made in less than 60 hours. This allows for a complete changeover on a weekend. The boiler itself is completely assembled and designed to provide the proper low heat release (not over 35,000 Btu per cu ft of furnace volume) required for coal firing. The use of refractory or castable baffles has been eliminated by substituting chrome alloy steel. Design also provides for fuel reinjection and over-fire air systems on both side walls and through the bridge walls.

The boiler is supplied with a control panel including all piping and wiring necessary for fully automatic firing with coal, oil, or gas. Changeover of controls is achieved by throwing switches.

• **INSTALLATION.**—Because the Navy is, in some cases, administratively best equipped, it constructs some plants for the Air Force. Two of the prototype boilers will be installed at the Klamath Falls Air Force Base, Klamath Falls, Oregon.

The Navy Department is believed to be the world's largest user of land based boilers. It is estimated that upwards of 12,000 boilers were in operation during the last heating season. Not all are used for heating service only, many are of small capacity. Included are rated capacities ranging from 600,000 Btu per hr to 200,000 lb of steam per hr; highest pressures are 2500 psig; land maximum steam temperature is 1100 deg F. Perhaps the majority operate at 15 psig or less. The annual cost for coal is approximately $10,500,000, and the cost for oil and gas fuel is slightly less than twice that amount.



New prototype boiler and control panel.

ASRE CONVENTION

held at Atlantic City, N. J.; 6 charters granted for new chapters; present officers continue to June.

Three technical sessions, three conferences and one forum were arranged as part of the program for the fifty-first annual meeting of the American Society of Refrigerating Engineers held at the Traymore Hotel, Atlantic City, N. J., December 1 to 3. About 800 members and guests attended.

Pursuant with a change approved earlier by the membership, a change will take place in the date for the annual meeting and this marks the last of the annual meetings held in December. The next annual meeting will be held in Cincinnati, Ohio, June 3 to 6.

• **OFFICERS.**—Because of the transition period from the Officers.—Because of the transition period from the past annual meeting until the one to be held next June, the present officers are held over until the Cincinnati meeting when new officers will be installed. The present officers are Leon Buehler, Jr., president; C. M. Ashley, first vice president; H. F. Spoehrer, second vice president; Cecil Boling, treasurer.

• **PAPERS.**—Abstracts are given of some of the papers presented at the technical sessions. W. L. Holladay of Holladay and Westcott, consulting engineers, Los Angeles, Calif., spoke on Heat Transfer at Simulated Altitudes. The paper briefly reviewed the problems of heat transfer in a temperature-altitude chamber, and both the analytical and experimental work done on refrigerant film transfer.

(*Continued on page* 120)

But why MEN over 45?

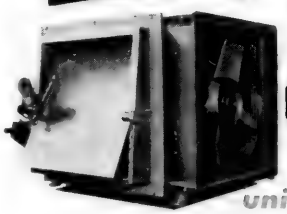
Our doctors still don't know *why*, but if you are a man over 45 you are six times as likely to develop lung cancer as a man of your age twenty years ago. They *do* know, however, that their chances of saving your life could be about *ten times* greater if they could only detect cancer long before you yourself notice any symptom. (Only 1 in every 20 lung cancers is being cured today, largely because most cases progress too far before detected.)

That's why we urge that you make a habit of having your chest X-rayed every six months, no matter how well you may *feel*. The alarming increase of lung cancer in men over 45 more than justifies such precautions. Far too many men die *needlessly!*

Our new film "The Warning Shadow" will tell you what every man should know about lung cancer. To find where and when you can see this film, and to get life-saving facts about other forms of cancer, phone the American Cancer Society office nearest you or simply write to "Cancer"—in care of your local Post Office.

American Cancer Society

NO UNSIGHTLY CHIMNEY ALLOWED (OR NEEDED) IN MODERN MOTEL DESIGN



Wing DRAFT INDUCERS

. . . supply positive, adequate, uniform, motorized draft at all times

The ever-increasing number of these deluxe roadside hostelries, complete with all modern conveniences, many with swimming pools, nurseries, restaurants, etc., indicates the success of this growing business in meeting a public demand.

In planning new establishments or enlarging the facilities the low streamlined, attractive design characteristic of the motel makes a tall unsightly chimney out of the question. And unnecessary, too, for WING motorized Draft Inducers provide positive, uniform, adequate draft for boilers and furnaces, independent of weather conditions. Easily installed, and in addition to their other advantages, pay for themselves in higher fuel-burning efficiencies. Most always they cost less than a tall stack.

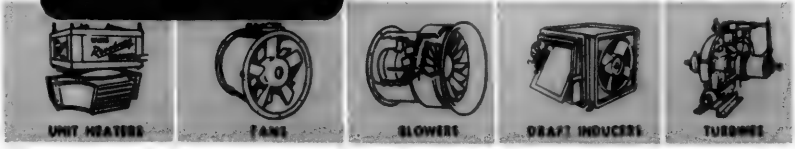
Write at once for comprehensive bulletin No. I-56. No obligation.

L. J. Wing Mfg. Co. 158 Vreeland Mills Road, Linden, N. J.

Factories: Linden, N.J. and Montreal, Can.

L. J. Wing Mfg. Co., Linden, New Jersey AC-1
Please send me Bulletin I-56—Draft Inducers
Name. . . . . .
Firm. . . . . .
Address. . . . . .
City. . . . . Zone . . State. . . . . .

Wing



ASRE CONVENTION

(*Continued from page* 118)

fin efficiency, and air side film factor. Charts were prepared for estimating temperature difference between fin surface and refrigerant, with corrections for refrigerant temperature: for estimating air side film factor at velocities from 100 to 10,000 fpm, altitudes from sea level to 100,000 ft and fin spacings from 4 to 12 per inch. Radiation was discussed and probable rates of radiation heat transfer calculated.

Cascade Refrigeration Systems for Ultra-low Temperatures, were described by D. J. Missimer, Pacific Refrigeration Company, Los Angeles, Calif. The lowest temperatures possible are limited primarily by the maximum compression ratio allowable and by the control devices. Cascade systems using the relatively new high pressure refrigerants greatly simplify the design and fabrication of ultra-low refrigeration equipment. Such systems may be economically employed for air or product temperatures from zero to —120F. Generally standard components, including evaporators, expansion valves (except for charge), compressors, oil separators and heat exchangers may be used throughout without modification. The cascade condenser to transfer heat from the low to high stages, is somewhat special.

The Reaction Between Electrical Insulating Paper and Monochlorodifluoromethane was covered by H. M. Elsey, Westinghouse Research Laboratories and L. C. Flowers, Westinghouse Electric Appliance Division. Paper and other forms of cellulose are widely used as electrical insulating materials in hermetic refrigerating motors. Accelerated aging tests of these materials at both 257 and 302 deg F show that cellulose deteriorates many times faster when it is heated in an atmosphere of monochlorodifluoromethane than when tested in the presence of Dichlorodifluoromethane. Cellulose is rapidly embrittled by the former gas after which it gradually changes in color to a dark brown or black. The experiments are of interest because, unlike cellulose, most organic electrical insulating materials deteriorate faster in the presence of dichlorodifluoromethane than in the presence of the other gas.

P. E. Glaser, Arthur D. Little, Inc., and C. F. Kayan, head of Mechanical Engineering Department, Columbia University, prepared a paper on Variation of Thermal Conductivity with Temperature of Insulating Powders. The authors described the experimental procedure for the measurement of a small temperature rise at a point in an infinite solid due to a continuous line source. Tests were carried out in a range from 70 to 300 deg, using several gases and pressures. The over-all accuracy and reproducibility of the test results was estimated to be ±2%.

Leon Buehler, Jr.
President

C. M. Ashley
1st Vice President

H. F. Spoehrer
2nd Vice President

Cecil Boling
Treasurer

E. R. Queer and E. R. McLaughlin of Queer and McLaughlin, consulting engineers, prepared a paper on A Field Evaluation of the Performance of Vapor-vented Insulation in a Large Freezer Warehouse. It describes a new concept in cold storage freezer wall design so that the wall is free to breathe to the interior cold space and is protected by a vapor barrier on the warm side.

Dr. Walter O. Walker, dean, Division of Research and Industry, and James B. Hoestettler, University of Miami, gave the results of A Study of the Water Sorption Characteristics of Silica Gel, Activated Alumina and Anhydrous Calcium Sulfate. The studies indicated that the zero-adsorption point for silica gel is reproducible after repeated activation water exposure cycles; that for activated alumina is not reproducible; for anhydrous calcium sulfate it is less reproducible than that of silica gel; and that there is no significant difference in the reproducibility of their zero-sorption point for atmospheric activation as compared with vacuum activation, except for activated alumina.

W. H. Decker, L. B. Smith and A. D. Turissini, General Chemical Research Laboratory, Allied Chemical & Dye Corp., are authors of the paper Determination of Boiling Point and Boiling Range of Refrigerants. It describes a new apparatus for accurately determining these two values of fluorinated hydrocarbon refrigerants and aerosol dispersants. Experimental data were included.

A research program designed to accumulate information on the condensation of Freon-12 in horizontal and inclined tubes was initiated by ASRE in cooperation with the Kansas State College Engineering Experiment Station. Findings of this study were presented in a paper by Richard C. Potter, assistant dean and Surendra P. Patel, graduate research assistant, Department of Mechanical Engineering, Kansas State College, titled Condensation of Freon-12 in a Horizontal Tube.

• **NEW CHARTERS.**—The society granted charters to six new chapters as follows: Southern Connecticut, Columbus (Ohio), South Florida, Florida West Coast, Rochester, N. Y., and San Joaquin (Fresno), Calif. These charters,

(*Continued on page* 122)

Scandinavia increases steam capacity, cuts costs burning coal the modern way

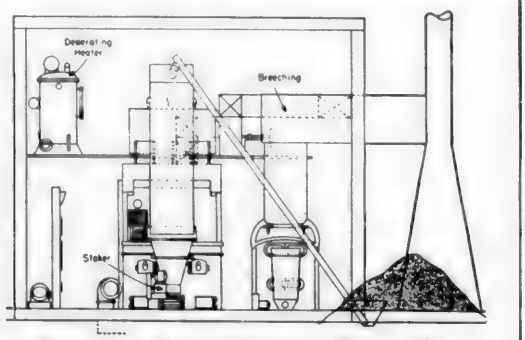
With its old power equipment overloaded by an ever-increasing demand for steam, Scandinavia Belting Co., Charlotte, N.C., took stock of its power situation. Boiler room efficiency was low and maintenance excessive; pressure fluctuated and labor costs had become a problem. Deciding to modernize, Scandinavia instituted a survey of all available fuels. On the basis of cost, coal was chosen. Today, after modernization, Scandinavia's power plant has increased steam capacity 150%, reduced fuel costs 15% and cut labor costs 70%. Increased efficiency and automatic operation have reduced the work force and assured a dependable steam supply at steady pressure with ample reserve for load growth. In addition, the cleanliness of the new plant has been an important factor in raising the morale of the employees.

facts you should know about coal

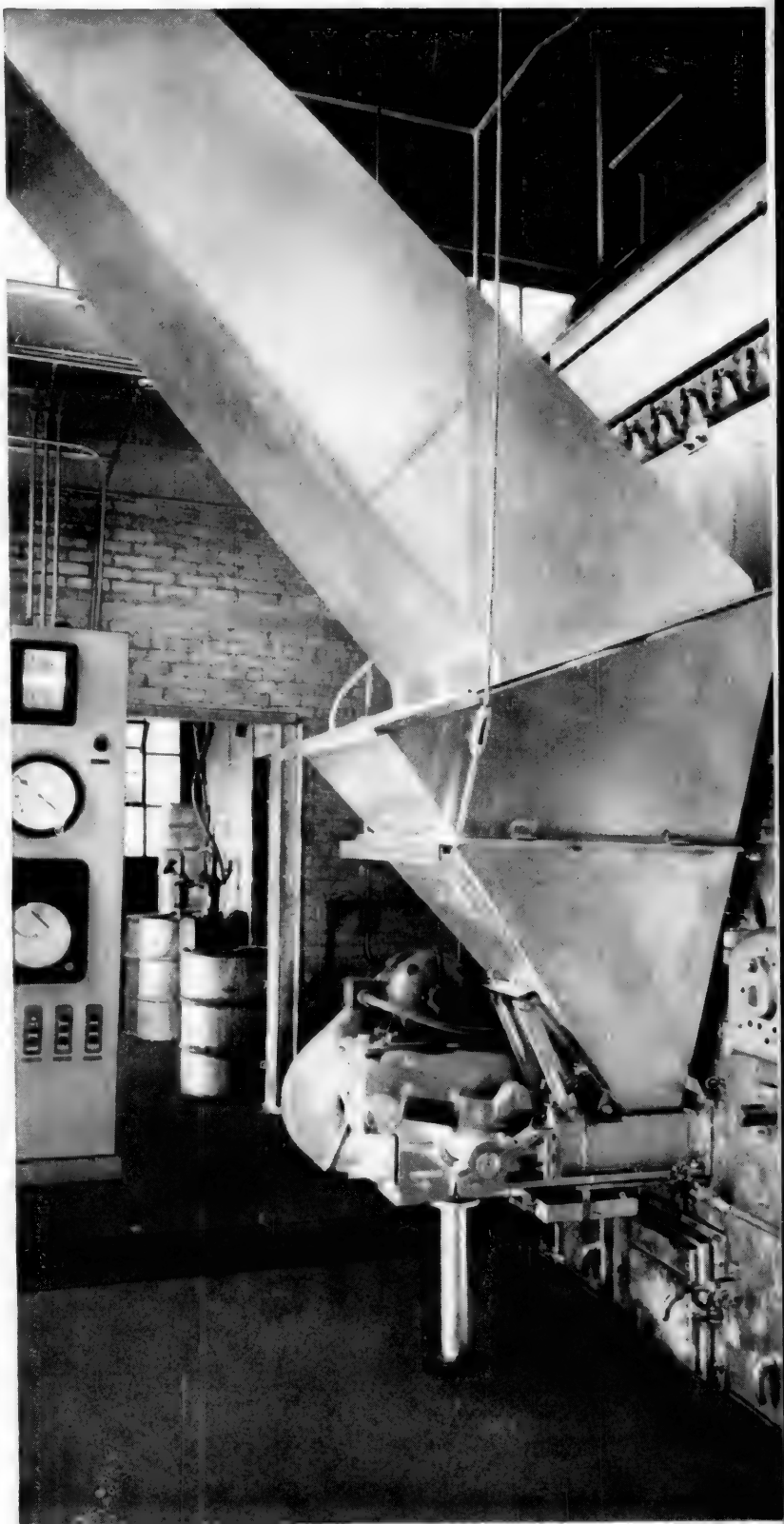
In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum • Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
Southern Building, Washington 5, D.C.



Elevation of Scandinavia's Power Plant



ASRE CONVENTION

(*Continued from page* 120)

which will be formally presented at the next convention, brings the total of chapters to 44.

• **MEETINGS.**—The next annual meeting will be at the Sheraton Gibson Hotel, Cincinnati, Ohio, June 2 to 6.

The semi-annual meeting is scheduled for the Hotel Statler, Boston, Mass., November 26 to 28.

The 1957 annual and semi-annual meetings are to be held respectively at Miami, Fla., and Chicago, Ill.

In 1958 there will be a joint convention with the American Society of Heating and Air-conditioning Engineers.

• **AWARDS.**—The Chicago trophy for the greatest net increase in membership was awarded to the Kansas City section. It will be the practice of the society to present all awards at the annual meeting with the exception of the best section paper and the Chicago trophy. The latter two will be presented at the semi-annual meeting.

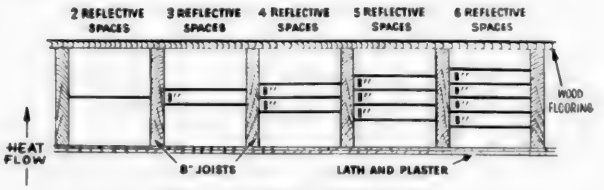
AIR SPACE INSULATION

studied at Bureau of Standards and analyzed by reflective insulation manufacturer.

Recent research on the insulation value of air spaces in walls by H. E. Robinson and F. J. Powlitch of the National Bureau of Standards, under the direction of R. S. Dill, chief of its Heating and Air-Conditioning Section, has resulted in findings published by the Housing and Home Finance Agency in Housing Research Paper No. 32, a booklet entitled The Thermal Insulating Value of Air Spaces.

An interpretative review and analysis of the Robinson and Powlitch findings has been made by Alexander Schwartz, president of Infra Isulation, Inc.

Apart from vertical or horizontal orientation, says Mr. Schwartz, the two factors which have significant effect on the thermal resistance value of reflective air spaces are the temperature difference between the bounding surfaces, and the depth of the space.



Joist insulation arrangements.

• **HEAT FLOW.**—The insulating value of a reflective space in both the up and down heat flow directions increases with increasing depth up to about 3½ inches, after which further increase seems to have negligible effect. The greatest part of the insulating value comes in the first inch of space. In the side heat flow direction, a maximum insulating effect is obtained with spaces about 1 inch in depth; for greater thicknesses, the insulating value first decreases slightly and then increases very slowly for depths of 2 inches or more. Except for downward heat flow, the changes of insulating value of reflective air spaces with space depth are less than 15% for depths greater than about one inch, Mr. Schwartz points out.

• **SPACE EFFECT.**—"Considerably more important is the fact that the insulating value of a reflective space with heat flow in any direction, increases markedly as the temperature difference between its bounding surfaces decreases and causes a significant decrease in convection. It is important because, except for heat flow vertically downward, halving the temperature difference across a space increases its insulating value considerably more than halving its depth may decrease it, providing the final depth is not less than about one inch."

For this reason, he said, for heat flowing in the up and lateral directions, successive reflective air spaces, one behind the other, follow a law of appreciating returns.

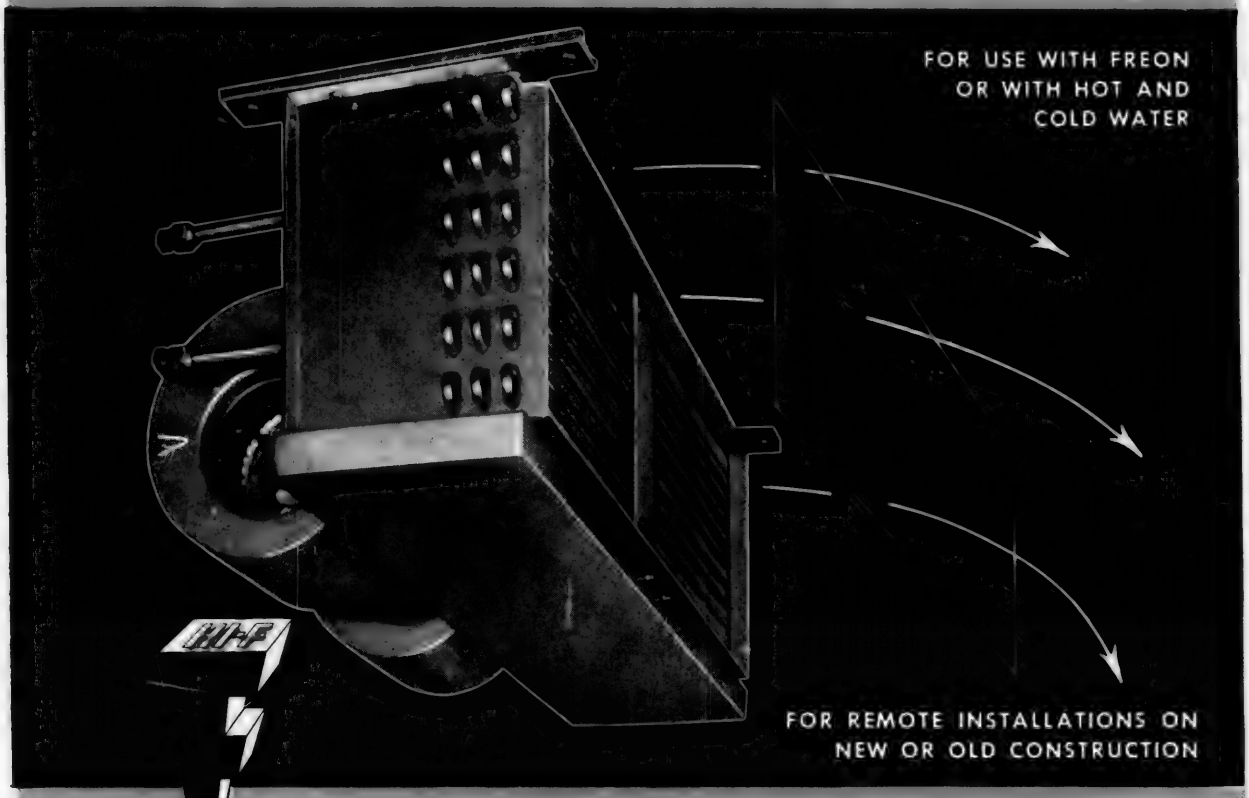
For example, assume heat to be flowing up in a group of 8-inch ceiling joist spaces, with ordinary fixed boundary temperatures (see illustration of joist spaces). Also assume that the depth of the first space is divided in half by an aluminum sheet; that the next space is divided in three parts by two aluminum sheets centered 1 inch apart; the next space divided in four parts with three sheets centered 1 inch apart; the next in five parts with four sheets; and the last in six parts with five sheets.

(*Continued on page* 124)

	UP-HEAT			DOWN-HEAT				SIDE-HEAT	
	C FACTOR	U FACTOR Attic Floor (roof excluded)	U FACTOR Ceiling & Roof (unfloored attic)	C FACTOR	U FACTOR Attic Floor (roof excluded)	U FACTOR Ceiling & Roof (unfloored attic)	U FACTOR Floor Over Crawl Space	C FACTOR Wall	U FACTOR Wall
3 REFLECTIVE SPACES 2 aluminum sheets	.143	.107	.102	.043	.039	.038	.051	.102	.077
4 REFLECTIVE SPACES 3 aluminum sheets	.105	.083	.081	.036	.034	.033	.040	.069	.057
5 REFLECTIVE SPACES 4 aluminum sheets	.082	.068	.066	.032	.030	029	.033	.051	.044
6 REFLECTIVE SPACES 5 aluminum sheets	.067	.058	.056	.029	.027	.027	.028	.041	.037

CONCEAL-X

THE NEW AIR CONDITIONING UNIT THAT REQUIRES NO FLOOR SPACE



for

MOTELS
HOTELS
HOMES
OFFICES
HOSPITALS
and
General Buildings

Conceal-X is built to save you money, make you money, and to better satisfy your customer. It is a real space saver designed for use in out of the way places and with the capacity to do a big job *quietly*. Recommended for motels, dwellings and buildings for Winter-Summer air conditioning. Conceal-X, installed in vestibules, overhead entrance ways, plenums, closets or hallways with or without false or furred ceilings, provides horizontal discharge to one or several adjacent rooms. Best of all, Conceal-X incorporates the Peerless patent-applied-for Hi-F finned construction that gives you greater B.T.U. efficiency year after year. May we send you bulletin and specifications?

PEERLESS OF AMERICA, INC.

MANUFACTURERS OF REFRIGERATION AND AIR CONDITIONING COILS SINCE 1912

Dept. A, 5930 N. PULASKI ROAD, CHICAGO 30, ILL., U.S.A.

AIR SPACE INSULATION

(*Continued from page* 122)

The insulating value of each of the reflective spaces thus formed, follows a pattern of increase as the number of subdivisions of the joist space increases. In other words, each 1-inch reflective air space where the joist has been subdivided in six parts, has greater insulating value than each similar 1-inch space where the joist has been subdivided in five parts; which in turn has greater value than each 1-inch space where there are four subdivisions, etc. This means of course, that the total insulating value in an 8 inch joist space of six such reflective air spaces is more than twice that of three such spaces, more than 50% better than four such spaces.

The explanation, according to Mr. Schwartz, is a lower temperature difference across each subdivided space where there are more subdivisions. The more the space is divided, the greater is the division of the original spread of temperatures; and so each space carries a smaller burden of temperature difference. This means a decrease in convection and a corresponding increase in the insulating value of each space.

• **LIMIT.**—This holds true down to space depths of about 1 inch, below which the diminution in insulating value due to increase in conduction because of lessening the depth, becomes the controlling factor.

A similar type of effect can be noted for lateral heat flow. For vertically downward heat flow this appreciation of value does not obtain.

The C and U values on the chart of thermal factors were calculated by Mr. Schwartz on the basis of work done by the National Bureau of Standards as reported in Housing and Home Finance Agency Research Paper 32. Structural composition of wall, floor and ceiling and the inside and outside temperatures are the same as those used for calculated values by the Bureau of Standards. The ceiling joist space was taken as 7⅞ inches deep, wall stud and space as 3⅝ inches, and floor joist space as 9⅝ inches. (For 5 and 6 space side heat flow, 5⅝ inches stud space was used.) The roof was taken as asphalt shingles or roll roofing on 25/32-inch solid wood sheathing.

ANNUAL MEETING

of heating and air conditioning engineers will hear 16 papers in Cincinnati. Keeton to be honored.

The 62nd Annual Meeting of ASHAE will be held January 23 to 25, 1956 in the Sheraton-Gibson Hotel, Cincinnati, O.

Comprised of eight sessions, the Annual Meeting will be called to order Monday morning, January 23, by President John E. Haines, Minneapolis, Minn. At that time reports will be given by the officers, Council and the Committee on Research. There also will be discussion and action on several proposed amendments to the Society's by-laws. During the three-day meeting, 16 papers will be presented, including several from the ASHAE Research Laboratory and cooperating universities. Symposium discussions on high velocity air distribution and air pollution by authoritative panels will take place Wednesday afternoon.

The general chairman of the Cincinnati Chapter Committee on Arrangements is Arthur W. Edwards, a member of the Society's Council. He is assisted by Vice Chairman Harold E. Russell. The honorary chairman is Howard E. Sproull, who served as treasurer of the Society in 1951 and was a member of Council from 1948 to 1951.

• **PROGRAM.**—The Society's Program and Papers Committee, under the chairmanship of Arthur J. Hess, 1954-55 Council member, Los Angeles, Calif., has selected the following technical papers:

Monday—January 23

10:00 a. m.

Noise Production and Damping in Water Piping, by W. L. Rogers

2:00 p. m.

Performance of Covered Hot Water Floor Panels, Part I—Thermal Characteristics, by E. L. Sartain and W. S. Harris

Thermal Design of Warm Water Ceiling Panels, by L. F. Schutrum, C. M. Humphreys and G. V. Parmelee

Heat Gain Through Glass Skylight Fenestrations, by D. J. Vild and G. V. Parmelee

2:30 p. m.

Moisture in Transient Heat Flow, by K. R. Solvason

Characteristics of Downward Jets from a Vertical Discharge Unit Heater, by S. M. Yen, Linn Helander and L. B. Knee

Resistance of Rectangular Divided-Flow Fittings, by L. G. Miller, C. H. Pesterfield and R. J. Waalkes

Tuesday—January 24

9:30 a. m.

Evaluation of Equipment Noise, by H. C. Hardy and D. E. Bishop

Electric Analogue Studies of Single Wall Sections by Harry Buchberg

Electric Analogger Analysis of a Cooled Structure Complex, by C. F. Kayan

10:00 a. m.

Index for Evaluating Heat Stress in Terms of Resulting Physiological Strains, by H. S. Belding and T. F. Hatch

Body Evaporation During Short Exposures to Various Temperatures, Humidities, Pressures and Mass Velocities, by J. W. McCutchan

Humidity Effects on the Odor Problem, by R. L. Kuehner

Wednesday—January 25

9:30 a. m.

Elements of Dual-Duct Design and Performance, by N. S. Shataloff

Branch Fitting Performance at High Velocity, by C. M. Ashley, S. F. Gilman and R. A. Church

Self-Actuated Room Control from High Speed Air, by E. F. Snyder, Jr.

2:00 p. m.

High Velocity Air Distribution Symposium

Duct Design—M. W. Wilson
Economics, Costs vs. Velocity—John Everetts, Jr.
Fan and Air Noises—C. W. Lemmerman
Duct Construction—K. A. J. Monier
Field Testing—R. D. Tutt

2:00 p. m.

Air Pollution Symposium

Health Aspects—Arthur Stern
Smog—Gordon Larsen
Regulations—Harry Ballman
Cleaning—J. W. May
Practical Approach—Charles Gruber
Enforcement—J. H. Carter

(*Continued on page* 126)

New HARTZELL

REVERSIBLE

ROOF VENTILATOR

- does the work of two fans with no loss of efficiency
- 28", 36" and 44" fan diameters
- capacity range: for exhaust—6800 to 23,600 CFM; for intake—6520 to 22,300 CFM
- meets the most stringent requirements for a black-out type roof ventilator
- available in curb, peak or slope base construction
- rugged construction, 20 gauge galvanized steel (18 gauge base on 36" and 44" models)
- head swings back on hinges to provide easy access for motor maintenance

This ventilator can also be supplied with any standard or Lo-Noise Hartzell fan when air flow in only one direction is required.

Please send me a copy of Bulletin A-112-A giving complete specifications and dimensions on the new Hartzell Reversible Roof Ventilator.

Name _____

Title _____

Company _____

Street _____

City & State _____

HARTZELL *propeller fan co.*
Div. of Castle Hills Corp.

103 Herrman Ave., Piqua, Ohio

ENGINEERING OFFICES IN PRINCIPAL CITIES

HARTZELL

PROPELLER FANS • BLOWERS • ROOF VENTILATORS • UNIT HEATERS

ANNUAL MEETING

(*Continued from page* 124)

• **AWARDS.**—The meeting will be concluded with the annual banquet on Wednesday evening at which time the newly elected officers will be installed. Mr. Haines will be presented with the past president's award, and Dr. Robert W. Keeton, Chicago, Ill., will receive the Society's highest honor, the F. Paul Anderson Medal. Dr. Keeton will be the first person in the medical profession ever to receive the Anderson Medal.

Dr. Keeton retired from the University of Illinois staff in 1951 after 26 years as a professor and head of the Department of Internal Medicine, College of Medicine.

Since 1935 when the Society began cooperative research at the University of Illinois College of Medicine on man's physiological adjustment to environment, Dr. Keeton has been active in this important ASHAE program. Under his leadership this research at the College of Medicine has continued to the present time with the support of the Society, the U. S. Public Health Service, and the University of Illinois.

One of the few medically trained individuals in this country who has been continuously interested in the heating, ventilating and air conditioning field, Dr. Keeton became a member of the Society in 1943. He has served ever since on the ASHAE Technical Advisory Committee on Air Conditioning in the Treatment of Disease and Physiological Research. Dr. Keeton was a member of the Society's Committee on Research from 1952 to 1954, and at the present time is a member of the Joint Committee on Standards for Comfort Air Conditioning.

• **RESIGNED.**—The resignation of David T. Donovan as assistant secretary of ASHAE has been announced. Mr. Donovan left the headquarters staff November 30 to assume a position with the General Electric Company as manual and data specialist in the commercial engineering section of the home heating and cooling department, Bloomfield, New Jersey. As Assistant Secretary since December, 1951, Mr. Donovan's responsibilities have included working with chapter officers, the Chapters Conference Committee, the Chapter Relations Committee, and in editing and production of the Society's Transactions.

HOME COOLING

has been installed in only one home in 22, Du Pont survey shows. Huge market exists.

Only one home in 22 is equipped with mechanical air conditioning at the present time, the Du Pont Company told the Air Conditioning and Refrigeration Institute at a November meeting in Atlantic City. The company was reporting initial findings of its first annual survey of the home cooling market.

That unexpectedly minor penetration of the estimated market of 45 million dwelling units was all the more surprising, officials of the company's Kinetic Chemicals Division pointed out, in view of the refrigeration industry's output of about four million room air conditioners in the last three years. One explanation, they theorized, might be that many of the room units which the industry thought were going into homes actually were being installed in commercial buildings not covered in the survey.

• **WITH.**—Only 4.3 percent of 13,441 householders personally interveiewed in a nation-wide scientific probability sample of metropolitan and urban residents said they owned a room air conditioner. Another 0.2% said their homes were mechanically cooled by central air conditioning systems, while an additional 6.2% indicated they were beating nature's heat and humidity with fans, evaporative coolers, and similar non-refrigeration systems.

• **WITHOUT.**—That leaves 89.3% of the nation's homes without some form of man-made cooling at the present time and represents a virtually untapped market for the air conditioning industry, said Robert J. Thompson, director of sales for the division.

• **WHY BUY.**—The survey, which statisticians said was based upon a scientific sampling system that provides maximum accuracy for a nation-wide projection, bore out the industry's experience in recent years that, try as they might with special promotion campaigns, it's a concentrated spell of hot weather that sells air conditioners. About half the owners of such equipment said they had bought their cooling units during the hottest part of the summer while 28% attributed their purchases to health reasons. Five per cent said they bought home units because they "got used to it" at their places of employment.

Coolness topped the list of things owners said they liked best about their room air conditioners, with 40% mentioning that feature. Another 22% said they could sleep much better after installing a mechanical cooler, while nine percent mentioned humidity control features and eight per cent said the units helped provide a dust-free room, with consequent reduction in cleaning chores.

Just a fraction under half of the owners said their air conditioners were installed in bedrooms, while 34% chose the living room as the cooler site.

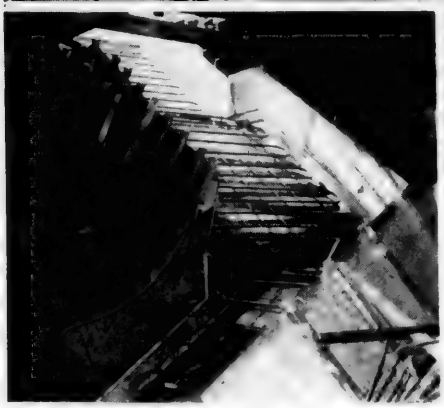
• **WHO.**—Ownership of room air conditioners was heaviest among those families owning their homes. Renters accounted for only 23.7% of the total cooling unit owners. And three-quarter ton units led all other sizes of room air conditioners, accounting for 47% of the total reported. Other sizes of cooling units in the homes of owners were as follows: one-third ton, 3.4%; one-half ton, 12.8%; one ton, 24%; larger than one ton, one per cent, and unspecified capacity, 11.7%.

Among owners of the room units, 83.5% said they were completely satisfied. Reasons for partial dissatisfaction among other owners included such things as noise of unit, inability of unit to maintain desired temperature, high operating or maintenance cost, and adverse effect on the appearance of the room or the house exterior.

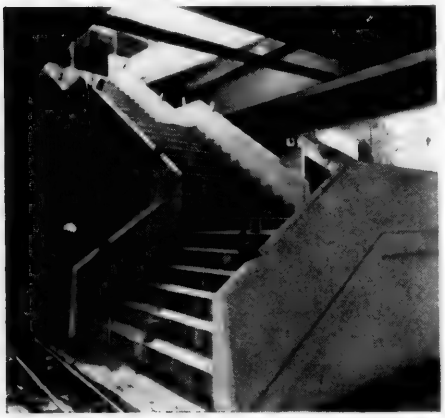
Ownership of room cooling units was greatest among owners or renters of homes in the $10-$15,000 class, which accounted for 30%. Another 44% of the units owned were divided equally between homes in the $7500-$10,000 and $15-$20,000 ranges.

Among non-owners of room air conditioners, the most frequently mentioned deterrents to purchase were price, cost of adequate wiring, high costs of operation, and, in the case of renters, landlord regulations.

Giant Snow Melting System for Staten Island Ferry Building features "*snowless*" stairway



Snow melting coils in place on stairway forms ... and freshly concreted stairway. Handrails to be installed later.



Reconstruction of the Manhattan Terminal of the Staten Island Ferry, operated by New York City's Dept. of Marine and Aviation, includes an extensive snow melting system. The long curving ramp, which starts at street level and expands into a semi-circular walkway on the second level, is completely fitted with snow-melting coils, as are the walkways.

A unique feature of the installation is that an open stairway from the street to the top of the ramp has also been equipped with snow-melting coils—one length of 1" pipe in the tread of each step.

Approximately 14 tons of 1" NATIONAL Steel Pipe were used in the grids, and about 5 tons of sizes up to 3" were employed as headers, connecting pipes, etc.

Architects, engineers, and contractors have been specifying USS NATIONAL Steel Pipe for over 60 years as the "standard" choice for conventional plumbing and heating systems.

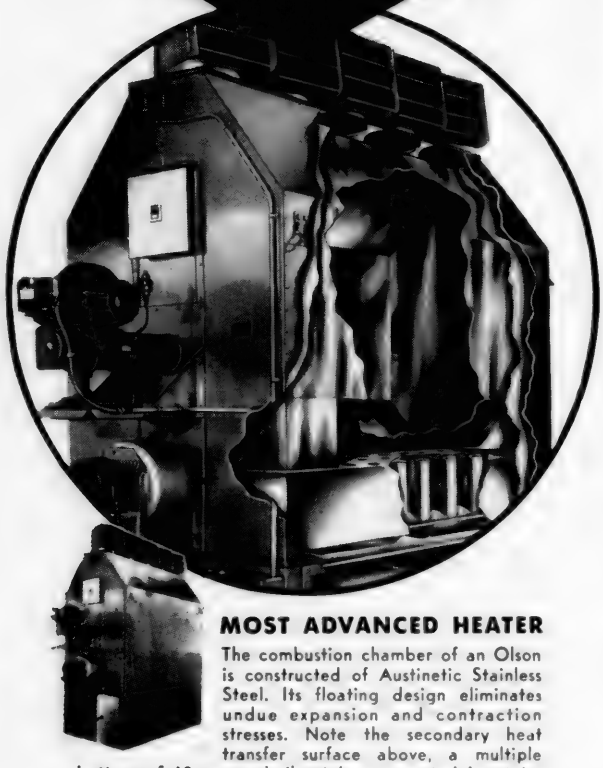
The inherent characteristics of NATIONAL Pipe are well known—smooth, uniform bending; sound, strong welding properties, and extra-long service life—characteristics that make NATIONAL Pipe ideal for such applications as snow melting and radiant heating, and give it the reputation for dependability that it enjoys. Such a well-deserved reputation inspires confidence—a nation-wide confidence that has made USS NATIONAL Pipe the largest selling pipe in the world. Write for free descriptive literature.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS **NATIONAL PIPE**

UNITED STATES STEEL

STAINLESS STEEL COMBUSTION CHAMBER OF THE OLSON



MOST ADVANCED HEATER

The combustion chamber of an Olson is constructed of Austinetic Stainless Steel. Its floating design eliminates undue expansion and contraction stresses. Note the secondary heat transfer surface above, a multiple battery of 10 guage boiler tubes separated by stainless steel baffles providing a four pass counterflow gas travel. The extended flue gas travel and extra heat transfer surface insures high efficiency and safe metal temperatures and long dependable heater life. Write for complete information on Olson Heaters.

Olson

STAINLESS STEEL DIRECT FIRED HEATERS

Gas—Oil—Dual Gas and Oil—300,000 to 2,000,000 BTU

CANFIELD, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

CLEANING UP THE AIR

(*Concluded from page 87*)

verting the *thermal rise* into (often) an actual fall, with the result that the small amount of sulphur dioxide left in may theoretically be of as much nuisance to the immediate surroundings as the full amount left in the hot gases. But these arguments depend on Bosanquet's (latest) equation, because London has too many other chimneys emitting sulfurous gases for practical measurement. It was refreshing in the discussion on this paper to hear N. G. Stewart of the Atomic Energy Research Establishment modestly explain that he could not contribute to the theoretical arguments—he could only tell the meeting what actually happened to chimney gases! Apparently, when air is used to cool the pile at Harwell, some of the argon in the air becomes radio-active. This is not at all dangerous, but it does enable it to be detected, and with airplanes, balloons and ground kit, Mr. Stewart had detected the gases and plotted the results. They did not appear to comply with any equations.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

ASHAE MEETING—Annual meeting of the American Society of Heating and Air Conditioning Engineers, Inc., at the Sheraton-Gibson Hotel, Cincinnati, Ohio. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JANUARY 23-25, 1956.**

PLANT MAINTENANCE SHOW—Seventh National Plant Maintenance & Engineering Show, at Convention Hall, Philadelphia, Pa. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. . . . . **JANUARY 23-26, 1956.**

VENTILATION CONFERENCE—5th annual Industrial Ventilation Conference, sponsored jointly by the Michigan Department of Health, and the School of Engineering, Michigan State University, to be held at the Kellogg Center, Michigan State University, Lansing, Mich. J. C. Barrett, ventilation engineer, Division of Occupational Health, Michigan Department of Health, Old Dewitt Road, Lansing 4, Mich. . . . . **FEBRUARY 6-9, 1956.**

SHORT COURSE FOR PIPELINERS—Seventh annual Corrosion Short Course for Pipeliners, at the Mayo Hotel, Tulsa, Okla., sponsored by the Tulsa Section of the National Association of Corrosion Engineers. J. C. Bell, general chairman, 119 W. Eighth St., Tulsa, Okla. . . . . **FEBRUARY 15-17, 1956.**

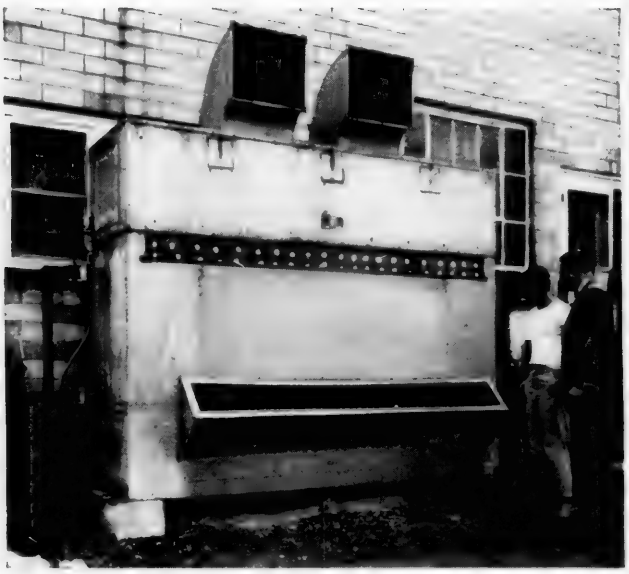
TESTING MATERIALS MEETING—National meeting of the American Society for Testing Materials, at the Hotel Statler, Buffalo, N. Y. Fred F. Van Atta, assistant secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **FEBRUARY 27-MARCH 2, 1956.**

CORROSION SHOW—1956 Corrosion show, held in conjunction with the 12th annual conference of the National Association of Corrosion Engineers, at the Hotel Statler, New York, N. Y. A. B. Campbell, executive secretary of the Association, 1061 M & M Building, Houston 2, Tex. . . . . **MARCH 12-16, 1956.**

INDUSTRIAL ENGINEERS CONFERENCE—Fifth annual spring conference of the American Institute of Industrial Engineers (Cleveland Chapter), to be held in Cleveland. W. S. Ritchie, Room 330, Cuyahoga Savings Building, 2123 E. 9th St., Cleveland 15, Ohio. . . . . **MARCH 15-16, 1956.**

ASME MEETING—Spring meeting of the American Society of Mechanical Engineers, at the Multnomah Hotel, Portland, Ore. C. E. Davies, secretary of the Society, 29 W. 39th St., New York, N. Y. . . . . **MARCH 18-21, 1956.**

(*Concluded on page 130*)



Operate Your Evaporative Condensers This Better Way

FRICK evaporative condensers with super-saving water-air control attachments automatically cut overall plant operating costs.

If you want to save water, save power, and save labor; if you must avoid freeze-ups in winter, and bothersome changes in head pressure the year 'round; if your refrigerating plant runs at times without an engineer—then you need the Frick-Mollenberg automatic condenser super-saving control.

This patented system shuts off the water, and later the fan, when not required. It utilizes water from the compressor jackets. It handles overloads, or pump failure, with fresh water. Water lines are drained in cold weather. Flooding or starving of coolers and coils from fluctuating feed pressures are stopped. These and other advantages are performed automatically, saving time and labor.

Only Frick Company is licensed to furnish these valuable features. Before buying any evaporative condenser, ask how this super-saving control can reduce operating expenses in YOUR plant. The Waynesboro, Penna., Office or a nearby Frick Branch Office will give you detailed information without obligation. Write, wire or phone.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

These Condensers Are Among Many in Buffalo Equipped With Frick-Mollenberg Super-saving Control.

MERCURY-TO-MERCURY SWITCH
requires no service—contacts never pit, burn or corrode.
PERMANENT ALNICO MAGNET
links water level with electrical controls; prevents failure of mechanical linkages.
CORROSION-RESISTANT FLOAT
is made of 304 Stainless Steel for long, trouble-free service. Can also be made of special materials for exterme local conditions.
NO-SCALE FLOAT CHAMBER LINER
"flexes" off scale; prevents float "sticking".

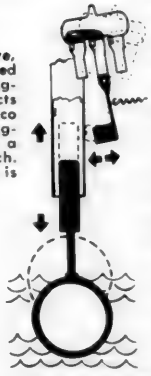
Here's "Low Maintenance"

BOILER SAFETY

MAGNETROL

BOILER WATER LEVEL CONTROLS

"Blow-down" the float chamber once-a-shift; inspect the switches once a month—that's all you have to do to keep a Magnetrol in tip-top *safe shape.* It's made that way. The secret is all in the simple magnetic operating principle *as pioneered and perfected by Magnetrol.*



A magnetic sleeve, raised and lowered within a nonmagnetic tube, attracts or repels an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

Standard Magnetrol Units are available for pressures to 600 psi and temperatures to 750°F., for single or multi-stage control with as many as three separate switching actions. Also special units for more extreme requirements. For full details, mail coupon.

MAGNETROL, Inc.

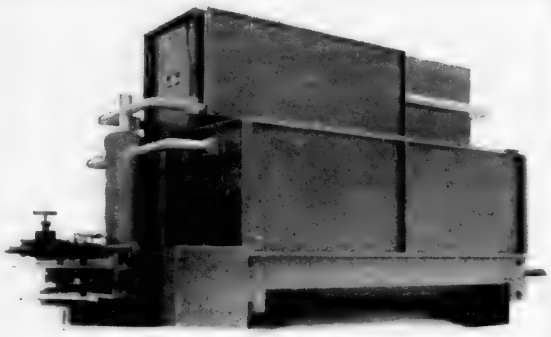
MAGNETROL, INC., 2106 S. Marshall Blvd., Chicago 23, Ill.
Please send Catalog Section III with full information about Magnetrol Boiler Water Level Controls.

Name_____

Company_____

Address_____

City_____ **Zone**____ **State**_____



NIAGARA SECTIONAL
***Aeropass* CONDENSER**

gives you lower cost refrigeration,
saves you ***LABOR,*** *Power, Water*

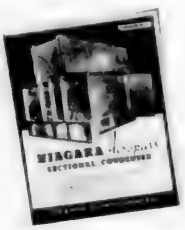
- **Because Niagara "Duopass" pre-cooling removes super-heat and gas condenses at lower temperature.**
- **Because the system is automatically purged of oil.**
- **Because the new design improves the heat transfer to the out-door air by evaporation.**
- **Because these features keep the condenser working for long life with "new plant" efficiency... always full capacity.**
- **Because you save 95% of cooling water cost.**

You save labor in upkeep. With full access to all parts and interior piping you see everything in easy inspections. You head off dirt accumulation and corrosion. Casing panels are removable without moving the coils. The coils can be cleaned from both sides.

First cost is low; freight is low because of the lowest space/weight ratio; you save much labor in erection. Capacity range is 90 to 240 tons. No other condensing method gives you so much saving in money and trouble.

Write for Niagara Bulletin 131.

NIAGARA BLOWER COMPANY
Dept. HV, 405 Lexington Avenue
NEW YORK 17, N. Y.
District Engineers in Principal Cities



NIAGARA *Over 40 Years' Service in Industrial Air Engineering*

COMING EVENTS

(Concluded from page 128)

POWER CONFERENCE—18th annual American Power Conference, at the Hotel Sherman, Chicago, Ill., sponsored by Illinois Institute of Technology, 25 W. 23rd St., Chicago, Ill. . . . . **MARCH 21-23, 1956.**

LUBRICATION ENGINEERS MEETING—Annual meeting of the American Society of Lubrication Engineers, at the William Penn Hotel, Pittsburgh, Pa. Secretary of the Society, 343 So. Dearborn St., Chicago, Ill. . . . . **APRIL 4-6, 1956.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at The Greenbrier, White Sulphur Springs, West Virginia. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. . . . . **APRIL 19-21, 1956.**

LIQUEFIED PETROLEUM GAS SHOW—Convention and trade show of the Liquefied Petroleum Gas Association, at the Conrad Hilton Hotel, Chicago, Ill. R. E. Borden, director of publicity of the Association, 11 S. LaSalle St., Chicago 3, Ill. . . . . **MAY 6-9, 1956.**

AIR CONDITIONING AND REFRIGERATION MEETING—Annual meeting of the Air Conditioning and Refrigeration Institute, at The Homestead, Hot Springs, Va. Secretary of the Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. . . . . **MAY 7-9, 1956.**

MECHANICAL CONTRACTORS MEETING—Annual meeting of The Mechanical Contractors Association of America (formerly, Heating, Piping and Air Conditioning Contractors National Association), at The Brown Hotel, Louisville, Ky. Secretary of the Association, 1250 Avenue of the Americas, New York 20, N. Y. . . . . **MAY 15-18, 1956.**

ASRE MEETING—52nd annual meeting of the American Society of Refrigerating Engineers, at the Sheraton-Gibson Hotel, Cincinnati, Ohio. R. C. Cross, secretary of the Society, 234 5th Ave., New York 1, N. Y. . . . . **JUNE 3-6, 1956.**

NDHA MEETING—47th annual meeting of the National District Heating Association, at the Inn and Lodge, Williamsburg, Va. J. F. Collins, Jr., secretary-treasurer of the Association, 827 N. Euclid Ave., Pittsburgh, Pa. . . . . **JUNE 4-7, 1956.**

PLUMBING AND HEATING EXPOSITION—1956 National Plumbing and Heating Exposition, in conjunction with the 74th meeting of the National Association of Plumbing Contractors, Inc., to be held in the Milwaukee Auditorium, Milwaukee, Wis. Secretary of the Association, 1016 20th, N. W., Washington, D. C. . . . . **JUNE 11-14, 1956.**

OIL-HEAT SHOW—21st National Oil-Heat and Air Conditioning Exposition, at the new Coliseum, New York, N. Y., to be held concurrently with the 34th Annual OHI Convention of the Oil-Heat Institute of America, with headquarters at the Park Sheraton Hotel, New York. R. H. L. Becker, managing director of the Institute, 500 Fifth Ave., New York 36, N. Y. . . . . **JUNE 11-16, 1956.**

ASME MEETING—Semi-annual meeting of The American Society of Mechanical Engineers, at the Hotel Statler, Cleveland, Ohio. Secretary of the Society, 29 W. 39th St., New York, N. Y. . . . . **JUNE 17-21, 1956.**

TESTING MATERIALS MEETING—59th annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **JUNE 17-22, 1956.**

ASHAE MEETING—Semi-annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., at the Shoreham Hotel, Washington, D. C. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JUNE 18-20, 1956.**

INSTRUMENT SOCIETY EXHIBIT—11th annual Instrument-Automation Conference and Exhibit (International), of the Instrument Society of America, at the new Coliseum building, New York, N. Y. J. McCaffery, assistant executive secretary of the Society, 1319 Allegheny Ave., Pittsburgh 13, Pa. . . . . **SEPTEMBER 17-21, 1956.**

HEATING AND AIR CONDITIONING EXPOSITION—1957 International Heating & Air-Conditioning Exposition, under the auspices of the American Society of Heating and Air-Conditioning Engineers, Inc., to be held at International Amphitheater, Chicago, Ill. E. K. Stevens, manager, International Exposition Co., 480 Lexington Ave., New York 17, N. Y. . . . . **FEBRUARY 25-MARCH 1, 1957.**

ACH&V's *Ad-Digest* AND PRODUCT INFORMATION SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement.

NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

PIPE HANGERS AND SUPPORTS. Inside front cover. A complete line of pipe hangers and supports is supplied through a coast-to-coast system of strategically located warehouses and jobbers by this manufacturer. The company maintains a staff of trained personnel that is ready to work with customers on the job in solving problems connected with the erection of pipe hangers and supports. ..... **Item 89**

CENTRIFUGAL ROOF VENTILATOR. Page 1. Running at low tip speeds, this centrifugal roof ventilator moves large volumes of air against static pressure. Low in silhouette, the ventilator is profiled to blend with modern architecture. A 16-page catalog is available containing selection data. ..... **Item 90**

INTEGRAL-FURNACE BOILERS. Page 2. Three boilers in a multi-unit installation produced 25,000 lb of steam per hour each at 110 psi pressure for heat, hot water, and various processing operations for a bakery occupying 12 acres. The oil-fired boilers are available shop-assembled in standard sizes for loads ranging from 250 to 40,000 lb per hour at steam pressures to 235 psi. A bulletin describing the boiler's features is available. ..... **Item 91**

DUCT LINER. Page 4. A spray-coated duct liner is made by this company of long textile type glass fibers. The liner permits up to 7500 cfs of air to be moved through a duct without objectionable noises and without eroding the duct lining. Its .021 friction coefficient compares favorably with the .019 coefficient of unlined metal ducts. An 8-page technical brochure is available. ..... **Item 92**

ALUMINUM INSULATION. Page 7. Multiple accordion aluminum envelops large volumes of air and creates layers of air space only as it is opened when finally stapled in place. The aluminum sheets have 97% reflectivity and 3% absorptivity and emissivity. Installed between wood joists, the layers of multiple aluminum and fiber retard inner and outer convection. Booklet is offered by the manufacturer along with samples. ..... **Item 93**

RADIANT HEATING PIPE. Page 9. A radiant heating system, serving 22,500 sq. ft. of floor area in a telephone company's new warehouse, uses more than 16,300 ft. of corrosion-resistant wrought iron pipe. Wrought iron pipe is suited for this service because it takes short radius bends, produces sound welds, and withstands damage during installation. Bulletin is available. ..... **Item 94**

FLUSH VALVES. Page 11. In each of the 400 rooms of a new 14-story Miami Beach hotel, diaphragm type flush valves were selected to overcome undesirable noise. A handbook is published by the valve manufacturer with 19 pages of details for exposed, concealed, and special flush valve installations. Over 75 blueprints, charts, formulae, and piping details are included in the handbook. ..... **Item 95**

WATER COILS. Page 13. Removable-header water coils are designed for installations where frequent mechanical cleaning of the insides of the tubes is required. The $\frac{5}{8}$-in OD tubes permit the coil to drain through the water and drain connections, and the coil can be pitched in either direction. The finned tubes are staggered in the direction of the air flow. Bulletin available. ..... **Item 96**

AIR CONDITIONING SYSTEMS. Pages 14-15. The air conditioning system for Philadelphia's new Penn Center features two 800 hp turbo water cooling systems located in the basement. They provide the cooling for this manufacturer's air conditioners in the individual rooms. As in all large buildings heat loads, glass and floor areas, and numbers of occupants had to be taken into consideration. Information on large air conditioning systems is available. ..... **Item 97**

UNIT HEATERS. Pages 16-17. The line of unit heaters manufactured by this company includes cabinet unit heaters in capacities from 18,000 to 108,000 Btu per hr, vertical discharge unit heaters in capacities from 30,240 to 576,000 Btu per hr, horizontal discharge unit heaters in capacities from 15,600 to 360,000 Btu per hr, and blower unit heaters in 170 ratings from 125,000 to 1,500,000 Btu per hr. Bulletin is available. ..... **Item 98**

UNIT HEATERS. Page 20. Horizontal delivery unit heaters for steam and hot water are built in two distinct types and 36 different capacities. Vertical unit heaters are offered in 26 different models, each with a choice of four types of air deflectors. Catalog is available. ..... **Item 99**

MOTOR-COMPRESSORS. Page 21. Condensing units with suction-cooled motor-compressors in sizes through 5 hp are this manufacturer's solution to the water requirement problems of central air conditioning. The new 2, 3, and 5-hp suction-cooled units are designed especially for air conditioning and other high suction installations. Specification sheets on the units are available. ..... **Item 100**

PACKAGED AIR CONDITIONERS. Page 22-23. Eighty-one of this company's packaged air conditioners provide a Wisconsin shopping center with 664 tons of year-round air-conditioning. Made in 3, 5, 7½, 10, and 15-ton sizes, the units can be used singly or in multiple to meet air conditioning needs. They can be used in space or concealed, with or without ducts; horizontal units are both air and water-cooled. Data is available. ..... **Item 101**

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154
155	156	157	158	159	160	161	162	163													

PLEASE PRINT Jan. H-56

This service available only to U. S. and Canadian readers.

Name..... **Title**.....

Firm .....

Nature of Firm's Business.....

Street .....

City..... **Zone**..... **State**.....

This card is void after Apr. 1, 1956

Ad-Digest

AND PRODUCT INFORMATION SERVICE

HERMETIC MOTORS. Page 24. Repetitive surge and dieelectric tests are given to the stator of this manufacturer's hermetic motors; every rotor is given an individual speed test. The motors are made in polyphase models from 1 to 10 hp, 60 cycle, 208, 220, or 440v, squirrel cage. Also in single phase models ¼ to 5 hp, 60 cycle, 115 or 230v, split phase, capacitor-start induction run and capacitor-start and run. Specifications are available. ----------Item 102

MOTOR-OPERATED VALVES. Page 25. A motor-operated valve is made by this company to control convectors, radiators, and unitary air conditioners by using hot water, low pressure steam, or chilled water to provide individual room control for schools, offices, hospitals, apartments hotels, and motels. The valve is made in both normally-open and normally-closed models. Control application data and bulletin are available. ----------Item 103

AIR CONDITIONING EQUIPMENT. Page 26. Two of this company's liquid chilling systems provide 250 tons of cooling for the air conditioning system of an army memorial center. The heart of each unit is a variable capacity radial compressor. Whether a job is large or small, the company's complete line of equipment will provide the right equipment for every requirement. Information on commercial and industrial air conditioning system is offered. ----------Item 104

RADIANT BASEBOARDS. Page 27. The features of this company's radiant baseboards include a modern appearance with safe, rounded corners and edges; a guide shoe for quiet operation and to prevent damage to the coils; and efficient heating from laboratory tested coils. Five different enclosure designs are made by the company. A bulletin illustrating the line of baseboards is available.----------Item 105

ROOF VENTILATORS. Page 28. Roof ventilators with output ratings which conform with actual ratings. Model CL is a modern low contour unit that maintains a neat appearance. Model J combines low, streamlined construction and maximum efficiency. Information available.--Item 106

TEMPERATURE CONTROL VALVES: Page 29. This company designs and manufactures valves in 4 types for accurate temperature control for every cooler application. It also makes thermostatic expansion valves, evaporator pressure regulators, solenoid valves, float valves, and float switches. Valve catalog is available.. ----------Item 107

LINE OF PUMPS. Page 30. This line of five pumps consists of a sewage ejector type, a double suction horizontally split case pump, a condensation pump and receiver, flexible- or close-coupled pumps, and a condensation return pump and receiver. Bulletins describing each type pump are available. ----------Item 108

AUTOMATIC TEMPERATURE CONTROL. Page 31. The temperature in a new senior high school, whose rooms vary from 100 to more than 10,000 sq ft, is controlled by this manufacturer's specially engineered automatic control system. An engineer from the company will gladly discuss temperature control problems without obligation. ---------- Item 109

LINE OF FILTERS. Page 32. Liquid, pipe line, air intake, and ventilation filters are among the many types of filters for industrial needs manufactured by this company. Special filters for unusual filtration problems are also made. By using the bulletin numbers, complete information on any of the filters may be obtained. Item 110

COOLING TOWER. Page 35. The cooling towers manufactured by this company completely cover the water cooling front for intermediate capacity services. They are available in wood or steel structure with asbestos cement board casing and in single or multi-cell arrangements. The company's engineers will help determine the sizes and models to meet customers' requirements. ----------Item 111

AIR CONDITIONING. Pages 36-37. This manufacturer's equipment plays a vital role in air conditioning one of the world's largest newspaper plants. A relatively high humidity must be maintained in the press room, and the heat generated by the metal pots in the stereotype section must be ventilated. In addition to equipment for complete central systems, the manufacturer also offers packaged air conditioners. ----------Item 112

GALVANIZED DUCT STEEL. Page 40-41. Six sheet metal contractors throughout the Middle West comment on the advantages of this company's galvanized sheet steel for duct work. The continuous galvanizing process eliminates the brittle iron-zinc layer that causes galvanized coatings to flake. ----------Item 113

REPLACEMENT STEAM TRAPS. Page 42. The replacement steam traps made by this manufacturer are not attachments, adaptors, or interior assemblies, but are complete traps with identical interior parts to those of the company's radiator traps. Made in a variety of patterns with roughing-in dimensions to fit practically all makes of traps, they are made to fit present lock nut and tail piece. Descriptive literature is available. ----------Item 114

CONTROL SYSTEM. Page 43. The air conditioning of a modern church is controlled by this manufacturer's system. For more than 60 years the company's control system has been providing thermal comfort in various types of buildings. Information on the control systems is available. ----------Item 115

STEEL SALES OFFICES. Page 44. This manufacturer of steel sheet and tube has 28 district sales offices located throughout the nation. They are staffed with men who know the steel business thoroughly and are qualified to help with steel requirements. You can get quick service whether you write, wire, or phone. ----------Item 116

RADIANT HEATING PIPE. Page 46. Radiant heating systems in churches provide gentle warmth without drafts, currents, or dead spots. The steel pipe used in these radiant heating systems is also widely used for heating, plumbing, snow melting, fire sprinkler systems, and power, steam, and air transmission. A 48-page booklet on radiant panel heating is available. ----------Item 117

AIR FILTER CURTAIN. Page 47. A filter curtain, when installed in this company's filter section up to 11 ft high (18,000 cfm), represents a full year's supply of media under normal operating conditions. Made of bonded glass fibers, the filter curtain is 5 ft wide and 65 ft long and can be wrapped on a spool to form a 13-in. diameter roll. Its movement is controlled by an automatic timer. Bulletin is available. ----------Item 118

STEAM MAINS INSULATION. Page 49. A triple-zone insulation for steam and return mains was used for the hot underground pipes of a new school. The pipes were covered with a thickness of 4 in. on all sides. The insulation is available in three temperature ranges; needs no housing or mechanical sheaths; needs only normal spacing; and is easy to use. Information is available. ----------Item 119

AIR FILTERS. Page 50. Substitute air filters mean contributions to the junk pile and higher cost. Get air filters that handle more air with a greater dirt-holding capacity. These filters with their heavier frames, reinforcing rods, and other features insure that each unit will continue to operate with replacements virtually eliminated. Complete catalog information is available. ----------Item 120

EXPANSION JOINTS. Page 53. Fewer joints per length of line are required by large steam distribution systems when this company's slip-type expansion joints are used. Made with traverses up to 12 in. single and 24 in. double, the joints may be packed under full steam pressure on the job. There is a lower pressure load on the end anchors. Bulletin is available. ----------Item 121

TEMPERATURE REGULATORS. Page 54. When installing a new or replacing an old temperature regulator, look for packless construction; a guarantee against wire drawing; a broad control range; easy maintenance; double duty and self-operation. These points are important, and this

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U.S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

manufacturer's regulators offer all these features and more. Bulletin on temperature regulators is available. ----- **Item 122**

DUCT SILENCER. Page 55. A combination pressure reducing valve with a duct silencer is made by this manufacturer to quiet noise in high velocity systems. Installed directly in the duct work ahead of the diffusers, a single unit can handle silencing and pressure reduction for up to 3000 cfm and is adaptable to small systems and pneumatic control. Information is available. ----- **Item 123**

COPPER WATER TUBE. Page 111. One contractor installs copper, whether or not codes call for it, when imbedding plumbing and heating lines or radiant panel heating coils in a concrete slab. Fewer joints are necessary and copper is non-rusting. Technical advisory service is available to help solve installation problems. ----- **Item 124**

COOLING TOWERS AND CONDENSERS. Page 113. Cooling towers, in 2 to 120-ton capacities, and water-cooled condensers, in 1/3 to 25-ton capacities, are matched to work with each other. The wetted deck surfaces of the towers carry a 20-year guarantee against rotting or fungus attack. The condenser's tubes can be cleaned by a mechanical cleaning tube. Detailed specifications are available. ----- **Item 125**

TEMPERATURE REGULATORS. Page 115. A self-operating temperature regulator which automatically holds the temperature constant at the right point, is made by this manufacturer for the control of steam, water, gas, or other fluid flow. Various valve bodies and inner valves are available; single and double seat valves to 2 in. with bronze bodies. Bulletin gives information about all types. ----- **Item 126**

PACKAGED UNIT BLOWER. Page 117. No separate base layout is needed for the motor and fan of these packaged unit blowers, nor do V-belt drives have to be installed and aligned. The motor mounting may be adjusted; the cover may be opened vertically. Choose from capacities of 370 to 25,000 cfm; forwardly curved and backwardly inclined wheels. Catalog is available. ----- **Item 127**

DRAFT INDUCERS. Page 119. Motorized draft inducers make tall chimneys unnecessary on low modern buildings such as roadside hostelries. The draft inducers provide a uniform, adequate draft for boilers and furnaces independently of weather conditions. Bulletin is available. ----- **Item 128**

FACTS ABOUT COAL. Page 121. On the basis of cost, one Southern plant selected coal for fuel and increased its steam capacity 150%, reduced fuel cost 15%, and cut labor costs 70%. Up-to-date coal burning equipment can give 10% to 40% more steam per dollar and automatic coal and ash handling systems can cut labor costs. Further information and case histories are available ----- **Item 129**

COOLER USES NO FLOOR SPACE. Page 123. An air conditioning unit for remote installations on new or old construction requires no floor space and can be used with Freon or with hot and cold water. The unit can be installed in vestibules, overhead entrance ways, plenums, closets, or hallways with or without false or furred ceilings. It provides horizontal discharge to one or several adjacent rooms. The manufacturer will send bulletin and specification. ----- **Item 130**

REVERSIBLE ROOF VENTILATOR. Page 125. A reversible roof ventilator is made by this company with 28-, 36-, and 44-in. fan diameters in a capacity range for exhaust, from 6800 to 23,600 cfm and for intake from 6520 to 22,300 cfm. Available in curve, peak, or slope base construction, the ventilator is made of 20-gage galvanized steel. It is a blackout type ventilator. Bulletin is available. ----- **Item 131**

SNOW MELTING PIPE. Page 127. A giant snow melting system for a ferry building has approximately 14 tons of 1-in. steel pipe used in the grids and about 5 tons of sizes up to 3 in. employed as headers and connecting pipes. The characteristics of the pipe — uniform bending and strong welding properties — make it ideal for this application. Descriptive literature is available. ----- **Item 132**

DIRECT FIRED HEATER. Page 128. A unit with a stainless steel combustion chamber of floating design which eliminates undue expansion and contraction stresses. Information available. ----- **Item 133**

BOILER WATER LEVEL CONTROL. Page 129. Boiler water level controls are available from this manufacturer for pressures to 600 psi and temperatures to 750 deg F, for single or multi-stage control with as many as three separate switching actions. Special units for extreme requirements are also made. Catalog section is available. ----- **Item 134**

EVAPORATIVE CONDENSERS. Page 129. Evaporative condensers with water-air control attachments automatically cut overall plant operating costs. The patented system shuts off the water and later the fan, when not required. These and other advantages are performed automatically, saving time and labor. Information on the condensers is available. ----- **Item 135**

SECTIONAL CONDENSER. Page 130. A sectional condenser for removing superheat and condensing gas at lower temperatures is offered by this manufacturer. The system is automatically purged of oil and it transfers the heat to the outdoor air by evaporation. The capacity range of the condenser is 90 to 240 tons. Bulletin is available. ----- **Item 136**

Use this digest to locate and refer to items and advertisements appearing in this issue, then fill out and mail the prepaid postcard to request further information.

HEAT EXCHANGERS. Page 135. The tube ends of these shell and tube heat exchangers are expanded electronically by the manufacturer so that the circumference of each tube is joined to the face of the exchanger with the same pressure. The fit is as nearly perfect as modern science can achieve. Inquiries are invited. ----- **Item 137**

FINNED RADIATION. Page 136. For hot water and steam insulation, this company's finned radiation is available in 7 pipe and fin size combinations. The fins are made of cold rolled steel mechanically and permanently bonded to steel pipe. Enclosures, brackets, and fittings are also made by the company. A catalog and job specification sheet are available. ----- **Item 138**

COMMERCIAL-INDUSTRIAL BURNERS. Page 137. Six new gas and gas-oil fired burners are available for commerical and industrial heating. The burners are made for gas only; combination light oil (No. 2) and gas; and combination heavy oil (No. 5) and gas. The six models range in capacity from 720,000 to 8,600,000 Btu per hr. Complete information and prices are available. ----- **Item 139**

AIR RECOVERY CELLS. Page 137. Air recovery cells were installed in the air conditioning system of a photographic printing paper plant to remove minute quantities of phosphorous from the air which were spoiling the paper. The spoilage stopped immediately. Air recovery cells in any air conditioning or ventilating system will reduce needed amount of outside air and needed heating and cooling capacity. Information is available. ----- **Item 140**

AUTOMATIC BOILER. Page 138. An automatic boiler can be opened for cleaning or inspection by one man in less than one-half hour, for it has hinged doors at both ends. Fully automatic, the boiler is used for hot water and high or low pressure steam applications. Units range from 20 to 500 hp and can be gas, or oil, or combination fired. Catalog and name of nearest distributor are available. ----- **Item 141**

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154
155	156	157	158	159	160	161	162	163													

PLEASE PRINT Jan. H-56

This service available only to U. S. and Canadian readers

Name..... **Title**.....

Firm .....

Nature of Firm's Business.....

Street .....

City..... **Zone**..... **State**.....

This card is void after Apr. 1, 1956

Ad-Digest

AND PRODUCT INFORMATION SERVICE

WATER HAMMER ABSORBERS. Page 139. The pounding and noise caused by water hammer is prevented by the shock absorbers manufactured by this company. Installed in pipe lines, the absorbers prevent loosening fittings, damaging valves and appliances. Manual on water hammer is available.....**Item 142**

ROOF VENTILATORS. Page 139. You are assured of dependable ventilation when you specify these roof ventilators of which there is a type, size, and capacity for all your requirements. Line includes propeller fans, centrifugal fans, stationary, rotary, and ridge roof ventilators and accessories. Catalog available.....**Item 143**

STEAM HEATING COILS. Page 139. Steam distributing tube heating coils of this manufacturer have all tube outlets from the header extruded to provide double thickness for tube insertions. The tubes are fabricated from 0.035-in. copper; nipple connections are brass. Catalog is available. .....**Item 144**

INDUSTRIAL UNIT HEATERS. Page 140. Twelve basic sizes of industrial unit heaters—1-, 2-, and 3-fan models—are made by this company with capacities from 83,000 to 1,735,000 Btu per hr, handling from 2000 to 28,000 cfm. A choice of ten heating elements is offered for every size unit. Publication on the heaters is available. .....**Item 145**

POWER ROOF VENTILATORS. Page 141. Power roof ventilators have advanced modern design to fulfill architectural styling and job performance requirements. The ventilators are made with air capacities from 550 to 20,000 cfm and with belt or direct drives. A booklet is available that gives the design, construction, and performance data of the ventilators. **Item 146**

ICE BANKS. Page 141. A series of ice banks are made by this company for air cooling in churches, offices, stores, factories, etc., and may be added to existing systems for increased capacity. The ice bank is designed to deliver 32- to 34-deg F sweet water for recirculation through secondary equipment. It is made in capacities from 72,000 to 4,320,000 Btu per hr in a single unit; multiple units may also be installed. Catalog is available.....**Item 147**

STEAM TRAPS. Page 141. Float and thermostatic traps offered by this company have the thermostatic disc sealed under high vacuum to assure a positive and sensitive response over the entire operating range from 25 in. to 15 lb. The traps are available in five sizes from 100 to 5750 lb condensate per hour. Bulletin is available. .....**Item 148**

FIRE PROTECTION EQUIPMENT. Page 142. Interior fire protection equipment is made by this firm from components to standard custom-size cabinets and complete systems. The equipment is designed and proved to meet the requirements of utility, appearance and economy. An AIA file containing standard specifications for major items is available.. .....**Item 149**

FOG NOZZLES. Page 143. Fog nozzles for dispersing smoke and gases, reducing heat, minimizing water damage, and smothering fires have been developed by this company for interior hose units, working on pressures as low as 25 lb and also over 125 lb. Listed and approved for Class A and Class B fires, the nozzles are adjustable from off through full steam to 60-deg conical fog. AIA file on interior fire protection is available. .....**Item 150**

AIR VENTS. Page 144. Air vent valves to handle the toughest venting job include one model that gets heat fast to hard-to-heat radiators and another main line vent that eliminates air faster from main and risers. Detailed literature is available. .....**Item 151**

AUTOMATIC SHUTTERS. Page 144. Automatic shutters, with aluminum louvers are made by this company in sizes from 12 to 72 in. square, also rectangular. Automatic ceiling shutters are also made by the company for attic ventilation, the louvers being operated by the suction of the attic fan. Circular, prices, and a catalog are available. .....**Item 152**

UNION BONNET GATE VALVES. Page 144. Two-piece union bonnet radial seat gate valves are recommended for general service on steam, water, gas and oil lines where full, unrestricted flow is desired. Valves may be repacked under pressure. Specifications and details are contained in an illustrated brochure. .....**Item 153**

FANS. Page 145. The performance of these fans is in the prop design. Get top efficiency against resistances to 4½-in. static pressure, without special equipment, with these 7-blade propellers that move more air at slower motor speeds with less horsepower. Bulletin available. .....**Item 154**

POWERED FASTENERS. Page 145. A new power-actuated fastener has interchangeable barrels to set either ¼ or ⅜-in. fasteners into steel or concrete. The operator carries the second barrel in his pocket like a fountain pen. .....**Item 155**

ELECTRIC HEATERS. Page 145. Electric comfort heaters for low cost space heating are made in a choice of blower, convection, or radiant types with totally enclosed heating elements by this manufacturer. The heaters are also made in portable, mounted, or built-in units from ¼ to 40 kw with automatic or manual controls. Catalog of the entire line of heaters is available. .....**Item 156**

OIL UNIT HEATERS. Page 147. A farmer's auction market, open only on weekends, is now comfortably heated in an hour by eight of this company's oil-fired unit heaters. Burning No. 2 fuel oil, the heaters give immediate warm-up and have adjustable louvers to direct the heat where needed without cold spots or overheating. Unit heater catalog is available....**Item 157**

AIR METER. Page 147. A new air meter developed by this company gives, in one instrument, a simple, rapid method of balancing and checking any air system. The meter measures air velocities from 10 to 8000 fpm in increments as small as 5 fpm; temperatures from 0 to 255 deg F to within ½ deg; and static pressures from 0 to 10 in. of water, positive or negative. Bulletin with essential data is available....**Item 158**

UNIT HEATER. Page 148. A unit heater for general purpose and heavy duty and industrial heating is available from this manufacturer in 24 sizes, 8 coil selections, 159 ratings from 100,000 to 2,500,000 Btu per hr, and capacities from 2000 to 25,000 cfm each. For general purposes, the heater has non-ferrous coils; for heavy duty work it has wrought iron coils. Booklet is available.....**Item 159**

COOLING TOWERS. Page 149. To cool the large compressors in Chicago's Hotel LaSalle, one of this company's 350-ton cooling towers was installed. The company's line of forced and natural draft cooling towers is available in capacities from 3 to 1000 tons. They are constructed of heavy gage galvanized steel. To help select the right type and capacity tower, one of the company's engineers will submit proposals without obligation. Details are available. .....**Item 160**

GAS UNIT HEATERS. Page 150. Longer life and low cost service result from using these light weight gas unit heaters. The light weight cuts shipping and installation costs and the stainless steel construction slashes corrosion loss. Bulletin available. .....**Item 161**

VALVE LINE. Inside back cover. A line of flow controlled valves includes packless and packed valves, strainers, dryers, check valves, relief valves, 3-way valves, liquid gage sets, flange unions, and accessories for air conditioning, refrigeration, and industrial users. A catalog describing the valves and two catalogs on ammonia valves and steel fittings are available .....**Item 162**

BOILER SAFETY CONTROLS. Back cover. This manufacturer's line of boiler safety controls includes a feeder-cutoff combination for boilers below 5000 sq ft and maximum steam pressure of 25 lb; low water cutoffs for automatically fired boilers with a maximum steam pressure of 20 lb; and a water level control for boilers of any size with steam pressures to 150 lb. Booklet on low water in hot water boilers is available.....**Item 163**

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

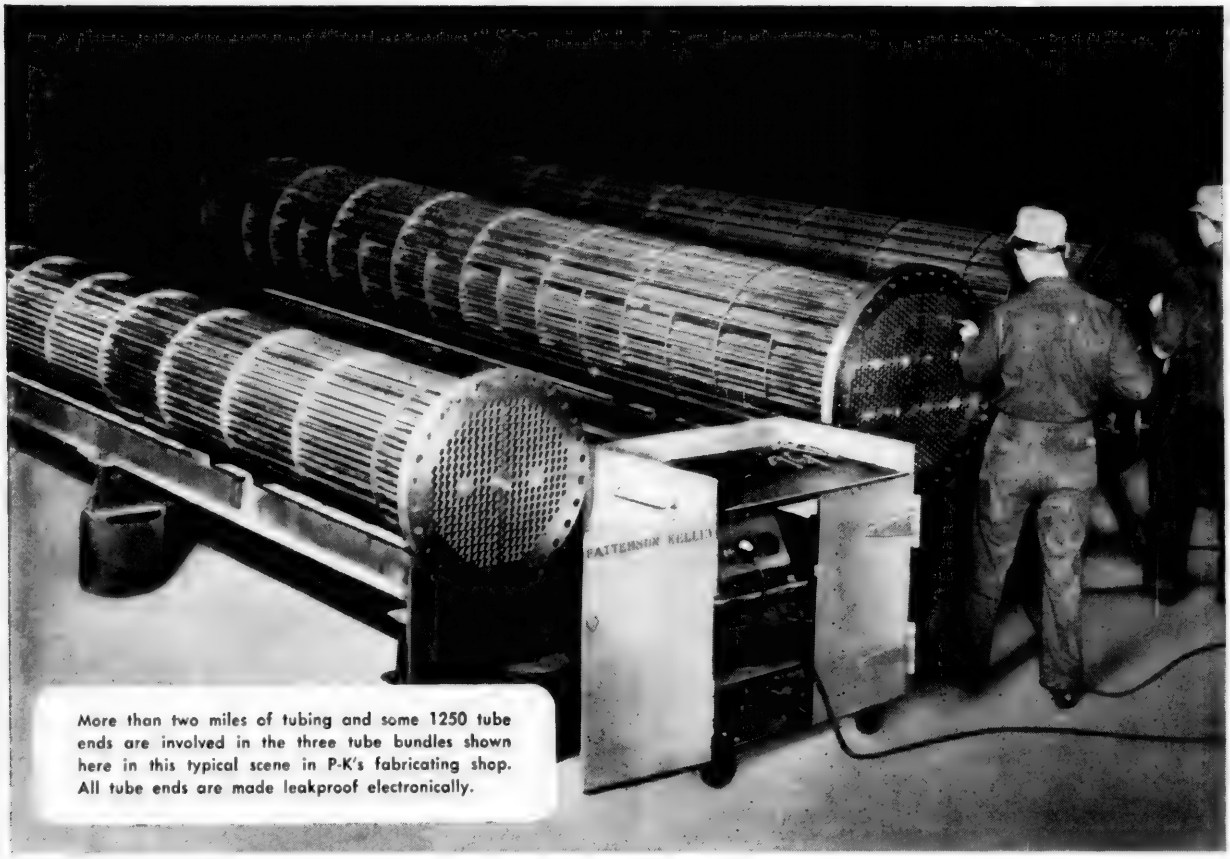
FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE



More than two miles of tubing and some 1250 tube ends are involved in the three tube bundles shown here in this typical scene in P-K's fabricating shop. All tube ends are made leakproof electronically.

HOW ELECTRONICS MAKES P-K EXCHANGERS BETTER THAN EVER

These men are expanding tube ends into the tube sheet—the "inner face" of a shell and tube heat exchanger that holds each tube in place. It's a time-consuming, precision-demanding job. Yet by doing it *electronically* with the equipment you see here, the circumference of *each* tube is joined to the face of the exchanger with exactly the same pressure. The fit is as nearly perfect as modern science can achieve. No leaks can develop in service because of the precise and uniform expansion of the tubes.

Electronic expansion of tubes is an example of how the fabrication of heat exchangers has changed since p-k built its first unit in 1880. But the fundamental method of building a good heat exchanger, like the shape and form of a shell and tube unit itself, has changed very little. The thermal design must be *right* . . . the craftsmanship *exact* . . . the testing *scrupulous*.

Leading engineers and contractors know these facts. They know, too, that such painstaking care costs money . . . that minor price advantages are often illusory . . . that the integrity of the manufacturer is their best safeguard . . . and that one maker has never compromised with quality.

To meet *your* needs in heat transfer equipment, we invite your inquiry . . . by mail, phone, or personal visit to our plant.

The Patterson-Kelley Co., Inc., 910 Burson Street, East Stroudsburg, Pa. Offices in principal cities.

PATTERSON P KELLEY

2588

Heat Exchangers • Convertors • Storage Water Heaters • Condensers • Storage Chillers • Oil Heaters • and all types of heat transfer equipment

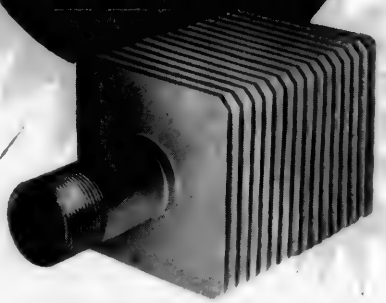
GREATER HEATING EFFICIENCY

THE radiant·ray WAY

T.M. REG. U.S. PAT. OFF.

WITH

AIRFOIL* FINNED RADIATION



No Other Heating System Offers All These Advantages . . .

A custom-made heating installation with factory fabricated parts for

SCHOOLS • HOSPITALS • HOTELS
INSTITUTIONS
PUBLIC BUILDINGS
COMMERCIAL BUILDINGS

SAVES TIME! SAVES MONEY!

VERSATILE

For Hot Water and Steam Installations — Available in 7 pipe and fin size combinations.

DURABLE

Fins of cold rolled steel mechanically and permanently bonded to steel pipe.

MORE HEAT

Exclusive radiant-ray Airfoil fin design assures maximum heat output.

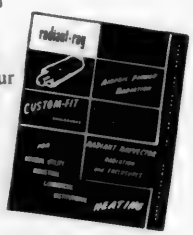
ADAPTABLE

Customfit* enclosures with flat or sloping top . . . or expanded metal grille . . . scientifically designed for maximum heat output.

EASY TO INSTALL

Brackets and fittings are factory fabricated and pre-punched for ease and speed.

Write for catalog and new "Time-Saver" Job Specification Sheets. Our factory trained heating engineers are available to help you with your heating installation problems without obligation.



*Airfoil and Customfit are Trade Names of

radiant·ray

T.M. REG. U.S. PAT. OFF.

RADIATION, INC.

P. O. Box 64 • Newington, Connecticut

IN THE FIELD

Kritzer Radiant Coils, Inc., announces the appointment of **Neviaser & Hoddinott,** 2430 Pennsylvania Ave. N.W., Washington 7, D. C., as sales representative in the Washington area.

The Ramset Fastening System, Winchester Western Division of Olin Mathieson Chemical Corp., has moved New York headquarters to 132 Nassau St. It was formerly located with the Metals Division at 29-27 41st Ave. in Long Island City. **Joseph F. Calvey** has been named assistant district manager for Ramset in the New York area.

The Trane Company, La Crosse, Wis., has announced the appointment of **William L. Mullins** to its Oklahoma City sales office. Mr. Mullins has previously been associated with the Trane office at Memphis.

York-Shipley, Inc., has appointed **R. M. Davies,** of Davies Engineering & Equipment Co., 224 N. Alabama St., Indianapolis, distributor for north and central Indiana. Davies will handle the complete line of the Industrial Division. **J. B. Johnson,** 5329 Crestview Drive, Indianapolis, has been appointed regional manager for the Industrial Division of York-Shipley in key cities in Indiana, Illinois (except Chicago), Michigan and Kentucky.

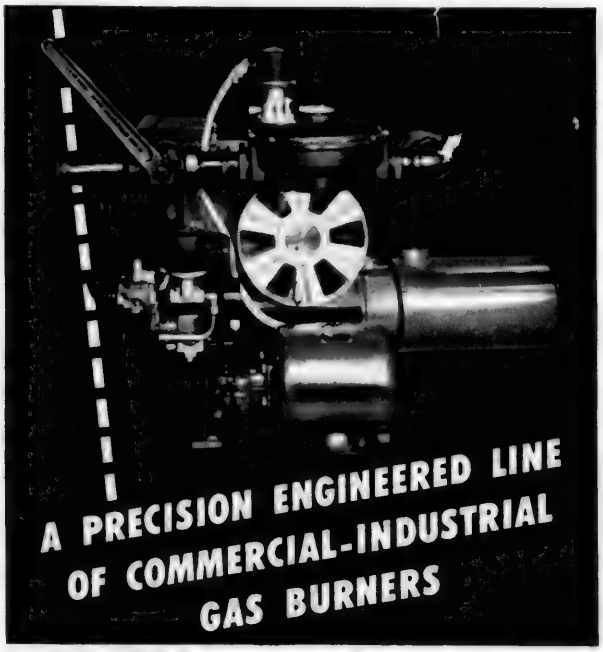
Johnson Service Company has moved its branch office formerly located in Newark to 1126 Morris Ave., Union, N. J. **Charles E. Nelson** is the branch manager.

Cleaver-Brooks Co. has appointed **Erickson Industrial Products Co.,** 6234 Peeler St., Dallas 19, Texas, representative in the Dallas industrial marketing area. The new company is under the ownership of **A. J. Erickson,** who was formerly with Combustion Control Corp. as district manager of the Southwest area. The territory served by the new company will include 58 counties in North Central Texas.

Airtemp Division of the Chrysler Corp. has announced these new appointments: **Charles A. McGinnis** was named district manager, Dayton, Ohio region. His headquarters will now be Cleveland, Ohio. **Robert T. Welch, Jr.,** was named district manager, Dayton region. His headquarters will be Louisville, Ky. **Garnet Walter Lunsford** was named district manager, Atlanta region. **Elmer F. Voss** was named field engineer, Atlanta region. **Robert W. Lamb** was named district manager, New York region, working primarily with Airtemp distributors and dealers in the northern part of New Jersey. **Thomas B. Sexton** was named district manager, room air conditioners, West Coast region. His headquarters will now be the Airtemp Los Angeles sales office. **R. B. Hamilton** was named district manager, Dallas region. He will be in charge of Airtemp room air conditioner programs in South and West Texas. **John E. Ballew** was named district manager, Dallas region. He will be in charge of North Texas for Airtemp.

NOW

for the first time at competitive prices



CLEAVER-BROOKS, the pioneer in low-cost commercial-industrial heating, now brings you another first: *6 brand new gas and gas/oil-fired burners* — all priced for fast selling in the season ahead!

Models for practically any heating need: gas only; combination light oil (#2) and gas; combination heavy oil (#5) and gas.

1. Now 30% to 40% lower in price than former models.
2. Highest efficiency — perfect gas flame.
3. All secondary air furnished by burner.
4. Correct air-gas ratio easily set.
5. Simple, low-cost installation.
6. Highest quality controls.
7. Flip-of-a-switch oil/gas interchange available.
8. 6 models — Capacity: 720,000 to 8,600,000 Btu.

Write for complete information and prices. *Cleaver-Brooks Company, Burner Division, Dept. A, 382 E. Keefe Ave., Milwaukee 12, Wisconsin.*

Cleaver Brooks

QUALITY BURNERS THAT BUILD YOUR BUSINESS

dorex SNIFFS TROUBLE SNUFFS IT OUT

● A maker of fine photographic printing papers was plagued by intermittent spoilage—evidently caused by some airborne impurity too dilute to be identified by any means of analysis at hand.

Connor engineers were called in as experts on air purification. They installed Dorex test equipment to determine the nature of the impurity. Later, these test units were analyzed in the Connor laboratory—revealing the cause of spoilage as minute quantities of phosphorus originating from a smelter some miles away

As a result of these findings, Dorex Air Recovery "C" Cells were installed in the air conditioning system—and the spoilage stopped immediately.

This is one example of how Dorex Air Recovery can purify outside air for sensitive manufacturing operations. Equally important is the positive indoor protection Dorex can provide in areas where smog is a problem.

Special cases aside, Dorex Air Recovery in any air conditioning or ventilating system will substantially reduce (1) the needed amount of outside air, (2) the needed capacity for heating and cooling, (3) installation and operating costs. Write us for full information, Connor Engineering Corporation, Dept. B-16, Danbury, Connecticut.

CONNOR ENGINEERING CORPORATION

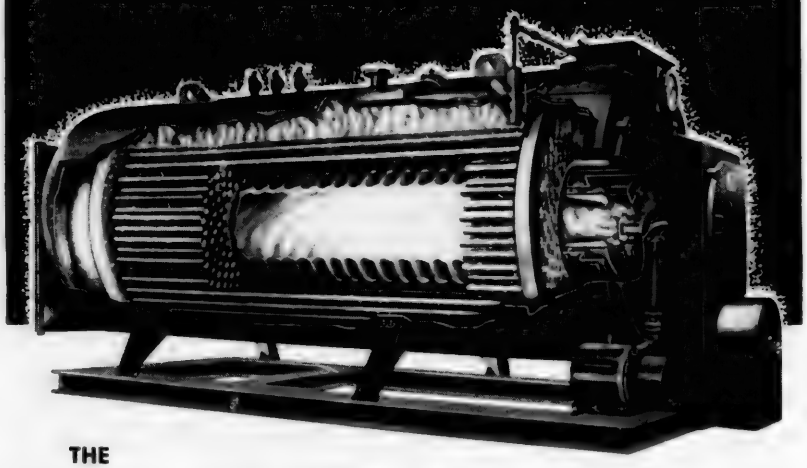
dorex®

air recovery

GET YOUR

STEAM and HOT WATER

FROM A **LOW COST PRODUCER!**



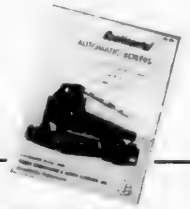
THE

***Continental* AUTOMATIC BOILER**

- generates the steam and hot water you need at low fuel cost and with little maintenance.
- is highly efficient—over 80% guaranteed—due to its unique "spinning gas technique".
- can be opened for cleaning or inspection by one man in less than ½ hour, for it has hinged doors at both ends.
- distributes heat evenly to the rear tube-sheet and all return tubes. This results in balanced water circulation and uniform longitudinal expansion of the entire pressure vessel.
- has long service life because of free, rapid water circulation, uniform heat transfer, simplicity of construction and quality workmanship.

Fully automatic, Continental Boilers are used for hot water and high or low pressure steam applications. Units range from 20 to 500 hp and can be gas, oil or combination fired.

Write for catalog and the name of your nearest distributor. Let us bid on the next boiler you need.



Send for all the facts on the Continental Automatic Boiler.

Continental AUTOMATIC BOILERS

BOILER ENGINEERING

and Supply Company, Inc.

7 Manavon St. • PHOENIXVILLE, PA. • Phone 5832

NEW CATALOGS

Use the prepaid postcard on page 131 for securing your copies of catalogs described in this department.

DEWPOINT INDICATOR BULLETIN — An 8-page bulletin (GEC-588B) describing a dewpoint recorder and indicator is issued by General Electric Co., Instrument Dept., West Lynn, Mass. In addition to giving descriptions and specifications of the instruments, the bulletin also contains a chart of the relations between the dewpoint and the moisture content of gases. ..... **Item 59**

ARTICLE ON INDUSTRIAL FANS—A reprint of an article on the selection and application of fans for industrial or mechanical draft applications is available from American Blower Corp., Detroit, Mich. The 10-page article discusses the characteristics which must be known before choosing a fan. ..... **Item 60**

FLEXIBLE HOSE BULLETIN — A brochure, Bulletin 50, describing the applications of flexible exhaust hose and duct in the metal working industries, is issued by The Flexaust Co., New York, N. Y. In addition to illustrating the uses for the hose and duct, the brochure has a selection guide. ..... **Item 61**

HEATING PLAN IS DESCRIBED—A departmental heating plan for factories is described in a bulletin (LL-2268) issued by R. D. Fageol Co., Kent, Ohio. Details of the system, which eliminates duct work, piping, radiation, diffusers and other components of large central heating units, are described and illustrated. ..... **Item 62**

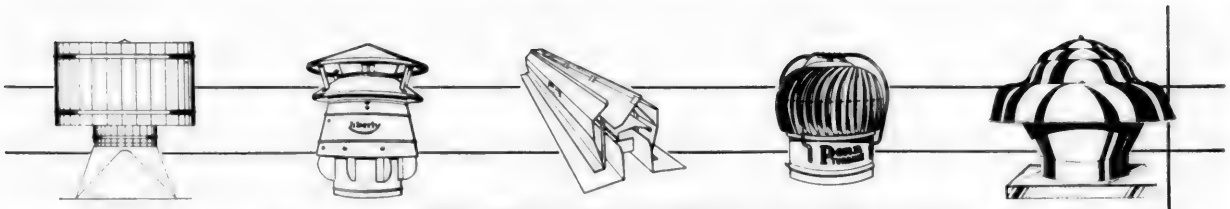
GRILLE CATALOG SUPPLEMENT — A bulletin illustrating and supplementing its current catalog of hollow blade and solid bar registers and grilles is issued by Register and Grille Mfg. Co., Inc., Brooklyn, N. Y. The folder illustrates the various styles available, gives their specifications, and shows how to specify or order the registers and grilles. ..... **Item 63**

AIR RECOVERY BULLETIN — Bulletin 106-D issued by Connor Engineering Corp., Danbury, Conn., covers Dorex Type G air recovery panels for removal of odors and vaporous impurities from recirculated air in comfort conditioning installations. Performance and selection charts are included. ..... **Item 64**

BULLETIN LISTS LINE OF FANS—An illustrated bulletin (AA-101) by Chicago Blower Corp., Franklin Park, Ill., describes the company's redesigned line of axial airfoil fans. The heavy-duty fans are listed in eight general categories for ventilating. ..... **Item 65**

BLOWER CATALOG — Air conditioning blowers, named Rex, for 1956 are shown in an 18-page catalog issued by Air Controls, Inc., Cleveland, Ohio. Seventeen standard belt-driven models are listed, and five sizes of direct-drive blowers are shown. ..... **Item 66**

(Continued on page 140)



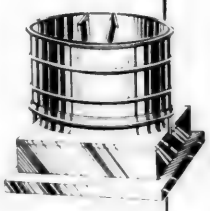
you're assured of
Dependable Ventilation

when you specify
PENN VENTILATORS

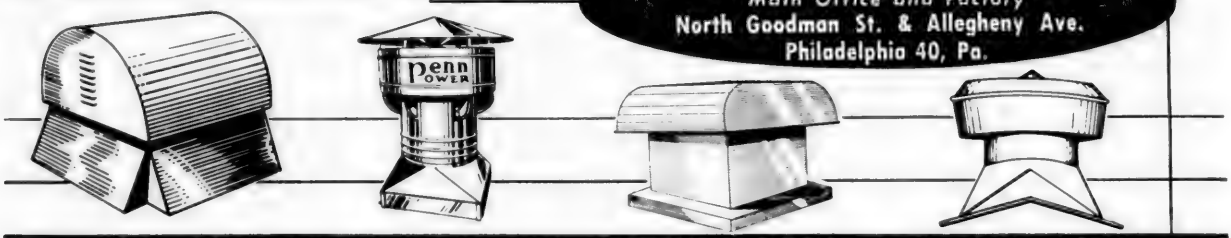
There is a type, size and capacity for all your ventilating requirements. Efficient and economical Penn Ventilators are easily installed and last long, providing years of trouble-free, inexpensive ventilation. They have been removing dust, vapors, smoke, heat, fumes and odors from public, commercial and industrial buildings for more than a quarter of a century.

Write for descriptive literature on the entire line . . . and for qualified recommendations and prompt quotations.

Manufacturers of: Propeller Fan — Centrifugal Fan, Stationary, Rotary and Ridge Roof Ventilators and accessory products. Representatives and distributors in principal cities.

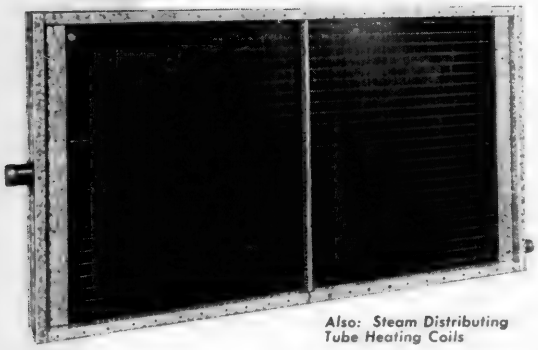


PENN VENTILATOR CO.
Main Office and Factory
North Goodman St. & Allegheny Ave.
Philadelphia 40, Pa.



FOR MORE THAN 25 YEARS THE BUILDERS' *roof* TOP LINE!

RIGIDBILT **STANDARD STEAM HEATING COILS**



Also: Steam Distributing Tube Heating Coils

MAXIMUM HEAT TRANSFER ASSURED!

All tube outlets from header are extruded, providing double thickness for tube insertions. Tubes are fabricated from 0.035" copper, nipple connections are brass, thus assuring strength for longer life with utmost economy.

RIGIDBILT IS BETTER BUILT — Write for Catalog

RIGIDBILT INC.

2852 WEST FULTON BLVD., CHICAGO 12, ILL.

HEATING • AIR CONDITIONING • REFRIGERATION

sure cure
FOR
destructive water hammer

Josam SHOCK ABSORBERS

The pounding, shaking noise you head in your pipe lines is "Water Hammer" — as destructive as it is noisy — loosening fittings, damaging valves and appliances, and causing expensive repairs!

JOSAM SHOCK ABSORBERS easily, inexpensively and permanently "cure" hammering and vibration in pipe lines. Send coupon today for latest scientific data.

JOSAM MANUFACTURING CO.
Dept. HV • Michigan City, Indiana

Please send free copy of Manual "S" on WATER HAMMER

Firm .....
By ..... Title .....
Address .....
City ..... Zone ..... State .....

Call on the GIANT

for your
Big Job of
Heating and Ventilating

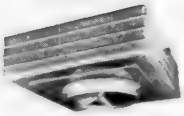
- Capacities from 83,000 to 1,735,000 Btu per hour
- For efficient air handling from 2,000 to 28,000 cfm
- 12 basic sizes—one-, two-, and three-fan models
- Choice of 10 heating elements for every size unit
- Featuring new Trombone steam-distributing tubes
- Giants of endurance and performance with economy

Nesbitt
INDUSTRIAL UNIT HEATERS

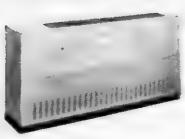
For descriptions and complete data on the Nesbitt Giants, send for Publication 404

THE NAME TO GO BUY IN UNIT HEATERS

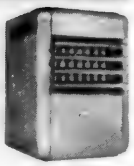
PROPELLER FAN UNIT HEATERS



LITTLE GIANT UNIT HEATERS



SERIES C UNIT HEATERS



GAS FIRED UNIT HEATERS

Made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa. Offices in principal cities

NEW CATALOGS

(*Continued from page* 138)

Use the prepaid postcard on page 131 for securing your copies of catalogs described in this department.

REMOTE CONDENSER BULLETIN—Remote air-cooled condensers are described in Bulletin AC-100, released by Halstead & Mitchell, Pittsburgh, Pa. A table of performance data for various size units at 40, 20, 0, and –20 deg suction is presented. A second table outlines coil and fan data. Dimensions and weights of the units are given, as are sketches showing construction features and mounting arrangements. ..... **Item 67**

HEAT FLOW GUIDE—Many of the problems connected with heat flow, the conservation of fuel for heating, or of power for air conditioning, and the maintenance of comfort in summer and winter are considered in a 48-page manual published by Infra Insulation, Inc., New York, N. Y. Intended as a technical guide for builders, and engineers, the booklet is entitled "Heat Flow by Radiation." ..... **Item 68**

ALLOY TUBING BULLETIN—Product engineers and others whose duties require a knowledge of alloy mechanical tubing are offered a publication by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. The bulletin, identified as TB-360, will acquaint the design engineer with the advantages to utilizing mechanical tubing. ..... **Item 69**

PVC FITTING AND FLANGE DATA—Unplasticized polyvinyl chloride (PVC) pipe fittings and flanges are the subject of a booklet issued by Tube Turns Plastics, Inc., Louisville, Ky. It discusses industrial applications of PVC piping and gives complete specifications for threaded and socket types of fittings and flanges in normal and impact grades. ..... **Item 70**

ELECTRIC MOTOR CATALOG—In 16 pages of cutaway illustrations and diagrams, Bulletin N-100-R, published by Howell Electric Motors Co., Howell, Mich., describes a line (series 100) of rerated motors. Both totally enclosed fan-cooled and open drip-proof types of integral horsepower motors are detailed, with other enclosures and mounting variations covered. ..... **Item 71**

STOKER HEATING DISCUSSION—A 12-page brochure (Form W-301), available from the Will-Burt Co., Orrville, Ohio, discusses the reasons for considering stoker-fed coal heat. Attention is given to the problems of heating in schools, institutions, and public buildings, and the data include an 18-school study. ..... **Item 72**

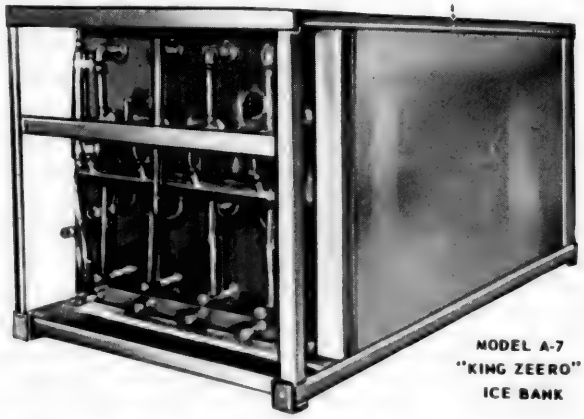
OIL LEAK DETECTION—An 8-page illustrated bulletin, No. 80, on the Paraprobe oil leak detection system for steam-type fuel oil heaters is issued by Davis Engineering Corp., Elizabeth, N. J. The bulletin gives a detailed explanation of the operation of the system and includes installation diagrams, standard specifications, and the method of determining rate of flow of condensate. ..... **Item 73**

(*Continued on page* 142)

Announcing "King Zeero's" NEW SERIES OF ICE BANKS
for More Efficient, Economical Air Conditioning

The "King Zeero" ICE BANK is designed for air cooling in Churches, Mortuaries, Theatres, Offices, Stores, Auditoriums, Factories, Clubs, Restaurants, etc. Ice Banks may be added to existing systems for increased capacity.

The "King Zeero" ICE BANK is designed to deliver 32° to 34° F. sweet water for recirculation through secondary equipment. Design temperatures may be obtained with mixing valves.



MODEL A-7
"KING ZEERO"
ICE BANK

CAPACITIES - 500 lbs. to 30,000 lbs. (72,000 B.T.U.'s to 4,320,000 B.T.U.'s) in a single unit. Multiple units may be installed.

THE KING ZEERO COMPANY
4302 W. Montrose Ave., Chicago 41, Ill.

CONSIDER THESE ADVANTAGES--

- DIRECTED COURSE OF WATER travels with "built-in" agitation.
- NO MECHANICAL AGITATION REQUIRED.
- LARGE WATER COMPARTMENTS spaced on 11" and 12" centers.
- 33⅓ EXTRA ICE CAPACITY safely attained with up to 300 G.P.M. water flow.
- ICE IS "BURNED OFF" PLATE COILS progressively, exposing prime and secondary surface for maximum flash cooling capacity.
- ICE THICKNESS automatically controlled - eliminates "freeze ups."
- 94 SIZES to fit space requirements. Other designs for special applications.
- OUR ENGINEERING SERVICE and plant facilities are at your disposal.

MAIL COUPON TODAY

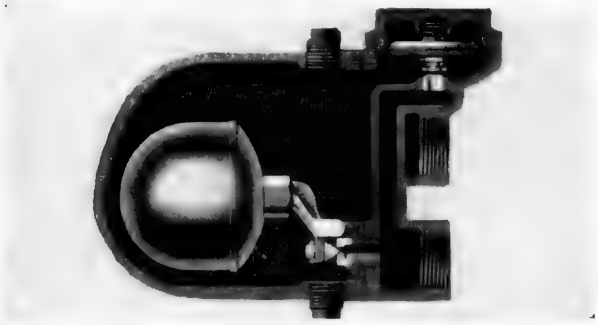
King Zeero Co., 4302 W. Montrose Ave., Chicago 41, Ill

☐ Please send me your new ICE BANK Catalog.

Name _____

Address _____

City _____ State _____



To make sure you vent all air ...depend on Dunham Traps

You're sure to get *all* air out of any steam system when you depend on the high air venting capacity of Dunham Float and Thermostatic Traps. Dunham's exclusive thermostatic disc—sealed under high vacuum—assures positive and sensitive response over entire operating range—25" to 15 lb.

Dunham design of float assembly gives instantaneous valve action—with valve under a deep water seal at all times. Available in five sizes from 100 to 5750 lb. condensate per hour.

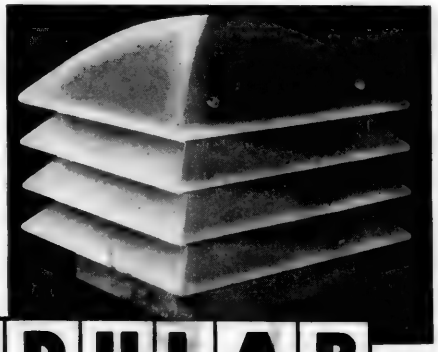
For full information about the complete line of Dunham Specialties, WRITE FOR BULLETIN ACHV-1.

DUNHAM

HEATING & COOLING EQUIPMENT
RADIATION • CONTROLS • PUMPS
UNIT HEATERS • SPECIALTIES

C. A. DUNHAM COMPANY, 400 W. MADISON ST., CHICAGO 6, Ill.

Air Capacities from 550 to 65,000 CFM Belt and Direct Drive



MODULAR

POWER ROOF VENTILATORS

- Our new and complete line of power roof ventilators with their advanced modern design and new construction features fulfill today's architectural styling and job performance requirements.
- With MODULAR construction the following important features have been accomplished — low profile, maximum strength, maximum net free areas, complete resilient mounting with no metal-to-metal contact between the top cap and body, power section and body, and body to curb base.
- Seven top view sizes available from 30" x 30" overall, increasing by 6" increments to 66" x 66". Ventilator height varies in 5½" increments called the "MODULAR stack."
- Write for booklet that gives complete design, construction and performance data, and shows how to specify the correct Modular Roof Ventilator for maximum performance plus economy.

A few choice territories open for manufacturers' representatives

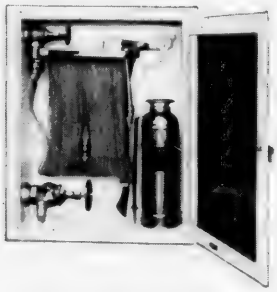
ATMOS CORPORATION
1215 W. Fullerton Ave.
Chicago 14, Ill.

ALLENCO

INTERIOR
FIRE PROTECTION
EQUIPMENT

designed to suit your design

COMPONENTS TO STANDARD "CUSTOM-SIZE" CABINETS AND COMPLETE SYSTEMS



Allenco fire equipment is designed and proved to meet 3 main requirements —

1. Utility — fire regulations, insurance standards
2. Eye-tility — unobtrusive in any setting, any structure
3. Economy — saves time in specifying* and installing

*A.I.A. file 29e2 gives ready to use standard (and alternate) specifications for major items. Write for your copy. Meanwhile, check Sweets.

Established 1917

W. D. ALLEN

MANUFACTURING CO.

Allenco Building • Room 716

566 West Lake Street

CHICAGO 6

NEW CATALOGS

(*Continued from page 140*)

Use the prepaid postcard on page 131 for securing your copies of catalogs described in this department.

STEEL TUBING FOLDER—Engineers and designers associated with the applications of tubular products in the process industry are offered a folder (TB-408) by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. The eight-page folder contains a brief description of various kinds of technical literature on specified types of tubular products and a table of chemical analyses, physical properties, mechanical properties, and creep strength of twenty steels. ..**Item 74**

BASEBOARD HEATING CATALOG—A 12-page catalog on baseboard heating systems is published by Thermo-Base Div., Gerwin Industries, Inc., Michigan City, Ind. Photographs of typical residential, commercial, and church installations are shown, and a table of capacities for various lengths of 6-in. pipe and elbows is given. ----------**Item 75**

AIR DIFFUSER SPECIFICATIONS—Information necessary for air diffuser specification writing is given in a condensed catalog, released by Multi-Vent Div., Pyle-National Co., Chicago, Ill. The catalog contains construction and installation details, performance data, sound level charts, and a description of the company's air diffusers. ----------**Item 76**

PUMP'S USES ARE DESIGNED—A flier, Data Sheet 955, outlining the ways a general-purpose bronze positive displacement pump can be utilized by original equipment manufacturers is issued by Eco Engineering Co., Newark, N. J. Information on the basic models available, the choice of materials of construction, capacities, impeller materials, motor mounts, bases and drives, is presented by the data sheet. ----------**Item 77**

HEAT TRANSFER EQUIPMENT — A 12-page, illustrated bulletin (No. 31), available from Buxton Mfg. Co., Dover, N. J., provides dimensions, data and capacities for the selection of the more commonly used types of heat transfer equipment. The bulletin stresses standardized production units which have been engineered by the company to meet a range of applications in the industrial, chemical, and process industries. ----------**Item 78**

VIBRATION MOUNTINGS CATALOG—A line of heavy-duty, general-purpose, steel spring vibration mountings is described in a catalog, No. SS-55, released by T. R. Finn & Co., Inc., Industrial Div., Hawthorne, N. J. Load capacities and dimension tables, illustrations of typical installations, and the company's engineering services are described. -------**Item 79**

PACKAGED BOILER BULLETIN—Bulletin, No. A-1041, which contains information on the Red Band line of Scotch type, steam boiler plants is published by Eclipse Fuel Engineering Co., Rockford, Ill. Operating characteristics of the gas, oil, and gas-oil burners are discussed along with recommendations for application of the units. ----------**Item 80**

TRANSFORMER CATALOG — A 32-page catalog (GED-2767) describing the line of G-E control transformers is available from General Electric Co., Schenectady, N. Y. Including autotransformers, machine tool transformers, and special application models, the illustrated publication contains ratings, dimensions, product features, and model numbers. ..... **Item 81**

ADJUSTABLE DRIVE BULLETIN—Literature (Bulletin 4400-PRD-229) published by Electric Machinery Mfg. Co., Minneapolis, Minn., illustrates the Ampli-Speed magnetic drive, which provides adjustable speed power for a range of applications. The four-page folder explains the use of the drive for both fan-type (centrifugal fans, pumps, and compressors) and constant torque loads. ..... **Item 82**

HOSPITAL AIR CLEANING—A case history of air cleaning in the Rockford Memorial Hospital at Rockford, Ill., is published by Trion, Inc., McKees Rocks, Pa. The literature calls attention to the particular benefits provided by electronically cleaned air. ..... **Item 83**

ENGINEERING SELECTION GUIDE—A guide for selecting an engineering firm is published by The Teller Co., Butler, Pa. The booklet has been prepared for those who are responsible for their company's entering new product fields, for plant automation, modernization, or expansion, and for those who need outside engineering help. ..... **Item 84**

WATER HEATER CATALOG—A 12-page catalog (Bulletin No. HDI-55) describing submerged coils for steel boilers is available from The Alstrom Corp., New York, N. Y. The catalog shows diagrams of coil locations in typical steel boilers and also shows hookups of typical coil installations and contains a rating and comparison chart. ..... **Item 85**

CONDENSER SPECIFICATIONS — The specifications of a remote type, air-cooled, refrigerant condenser are given in Bulletin No. U-210C published by Kramer Trenton Co., Trenton, N. J. Tables in the bulletin list the performance data, conversion factors, dimensions and fittings, and selection data for the air-cooled condensers. ..... **Item 86**

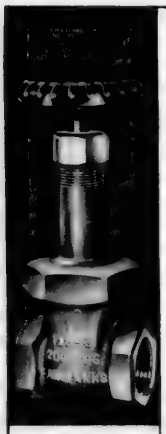
LOW TEMPERATURE BRAZING — A bulletin, No. 70, illustrating various methods of low temperature brazing is offered by Handy & Harman, New York, N. Y. The bulletin illustrates the brazing of copper to chrome, brass to brass, and steel to cast iron. ..... **Item 87**

BOOKLET ON HOME BUILDING — The advantages of copper, brass, and aluminum as building materials for the home are presented in two colors in a 30-page booklet entitled "Building to Endure with Revere" which is released by Revere Copper and Brass, Inc., New York, N. Y. Written for prospective home owners, as well as architects, builders, heating and plumbing contractors and sheet metal workers, the publication is replete with photographs and detail drawings of specific applications of the three nonferrous metals. ..... **Item 88**

Use the prepaid postcard on page 131 for securing your copies of catalogs described in this department.

FOG
NOZZLE
TYPICAL OF
ALLENCO
PRODUCTS,
BETTER
BY DESIGN
Water fog protects user by
SPECIFICATIONS:
Precision machined cast brass throughout; stem and deflector head manganese bronze; oil resistent neoprene packing adjusts for wear; 1½ inch, specified thread; polished brass or chromium finish. (table)
See how it meets the 3 main requirements—
1. Utility—
Listed and approved for class A (ordinary) and Class B (oil, flammable liquids, etc.) fires. Fast "wrist-twist" adjustment from Off through Full Steam, to 60° conical fog. Teeth can't clog.
2. Eye-tility—
Compact "functional" shape; uniform high-polish finish.
3. Economy—
Surprisingly low priced, considering essential precision work; requires no maintenance; serves indefinitely; kills fires that ordinary nozzles can't.
ALLENCO
FIRE PROTECTION
Write for your NEW copy of ALLEN on Interior Fire Protection (A.I.A. file 29e2) No. 150 Meanwhile check Sweets'.
W. D. ALLEN MFG. CO.
566 West Lake Street • Alliance Building • Rm. 718
CHICAGO 6

Fairbanks



UNION BONNET GATE VALVES

125 lb.

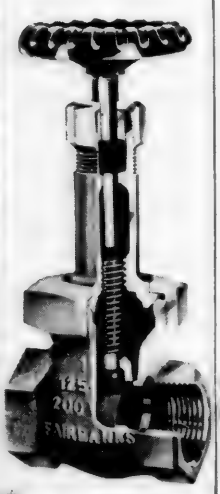


FIGURE U-0252
Rising Stem. Solid Wedge. Taper Seat. 125 Pounds Steam Working Pressure. 200 Pounds Cold Water, Oil or Gas Pressure. Non-Shock.

150 lb.

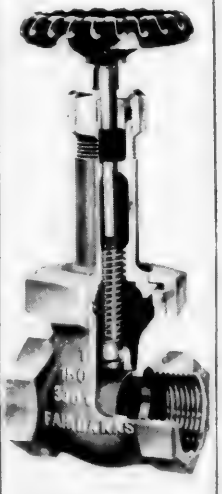


FIGURE U-0226
Rising Stem. Solid Wedge. Taper Seat. 150 Pounds Steam Working Pressure. 300 Pounds Cold Water, Oil or Gas Pressure. Non-Shock.

Two-Piece Union Bonnet Construction For Extra Easy Assembly And Disassembly

Two-piece **Radial Seat** Union Bonnet Construction provides extra easy assembly, long service, dependability that gives you extra value. **Radial Seat** provides line contact through accurately machined true ball and socket mating surfaces, for leakproof body bonnet joint. Two-piece construction eliminates sliding or scraping — prevents scoring — of body and bonnet mating surfaces during assembly and insures even contact pressure for perfect alignment of working parts. Heavy union nut will not deform under pressure and protects body and bonnet from distortion. Valves may be repacked under pressure when wide open—top seat above threads—out of line of flow—is protected against deposits and excessive wear.

SERVICE: Recommended for general service on steam, water, gas, and oil lines where full, unrestricted flow is desired. Valves give long trouble-free operation.

YOURS ON REQUEST: Colorful, illustrated brochure fully describes Fairbanks Bronze Gate Valves with Union Bonnet Construction, complete with specifications and details. Write for your free copy today.

Order Fairbanks products through your local distributor who is always happy to serve you.

THE **Fairbanks** COMPANY
393 LAFAYETTE STREET, NEW YORK 3, NEW YORK
BRANCHES: NEW YORK 3 • BOSTON 10
PITTSBURGH 22 • ROME, GEORGIA
Trucks • Valves • Casters • Wheels • Dart & "Pic" Unions

Elgo Ventilating Specialties

Famous Automatic Shutter

Unusually sensitive to air currents, causing the louvers to open instantly when the fan is turned on—and snap shut when the fan is turned off.
The aluminum louvers are weather-stripped. The best fitting shutter on the market.
Sizes from 12" to 72" square—
also rectangular
Write for circular and prices

"Echo" Automatic Ceiling Shutters

Used for attic ventilation. Installed in attic floor at the base of a penthouse, the louvers being operated by the suction of the fan.

Free CATALOG **ELGO SHUTTER & MFG. CO.**
2738 W. WARREN, DETROIT 8, MICH.

To be sure! **HEAT-TIMER VALVES**
handle the toughest venting job

VARIVALVE
gets heat fast to hard-to-heat radiators list $3.45

MAIN LINE **VARI-QUICK**
eliminates air faster from mains and risers list $10.

write for detailed literature

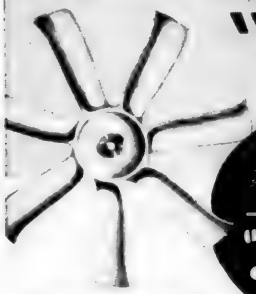
HEAT-TIMER *corporation* **657 BROADWAY NEW YORK 12, N.Y.**

Mfrs. of Heat-Timer Electronic Weather Actuated Heating Control — Heat-Recorder Totalizer — Motorized Valves — Varivalve — Therm-O-Valve — Main Line Quick Vent Valve — Smoke Indicator and Alarm — Smoke-Recorder.

ALL THREE
of the popular Reference Sections
High Temperature Water
by
OWEN S. LIEBERG
will be bound together as a 32-page covered booklet available soon for
$1.50
postpaid
Order now or write for quantity prices. Editor:
AIR CONDITIONING, HEATING AND VENTILATING
93 Worth St., New York 13, N. Y.

performance is in the

"prop"



NEW Aerovent "Semi-Pressure" FANS

7-Blade "Macheta" Airfoil Propeller

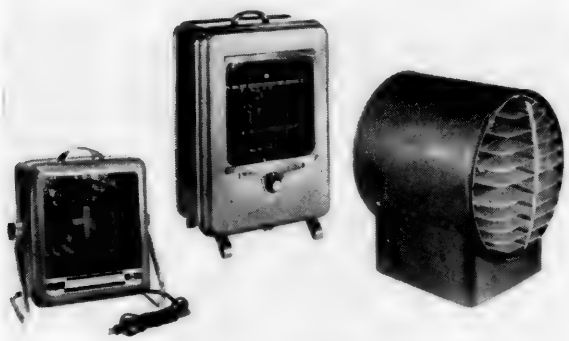
Now get top efficiency against resistances to 4½" SP *without* special equipment! Standard Aerovent units with new 7-blade propellers move more air at *slower* motor speeds with *less* horsepower. Write for folder.

Ask for bulletin S-50!

All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

Aerovent Fan Company, Inc.

Ash and Brandt Streets Piqua, Ohio



Dependable, low-cost space heating where and when you need it

CHROMALOX Electric COMFORT HEATERS

You have a choice of blower, convection or radiant types of heating, all with Chromalox totally enclosed heating elements. Portable, mounted or built-in units—¼ to 40 kw. Automatic or manual controls.

Sizes and types for heating any size space—from a small spot or room to an entire building. Easy and economical to install and maintain.

Write for your copy of quick selector Catalog D-52 to get complete information on Chromalox Electric Comfort Heaters and their applications.

For information on the complete line of Chromalox Electric Heaters request Catalog 50.

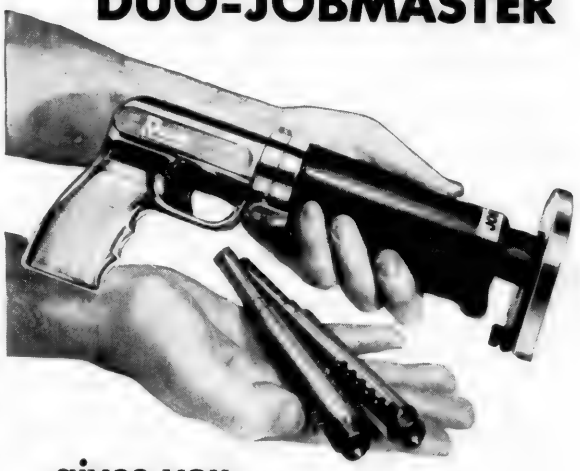
Let the Chromalox Sales Engineering staff solve your heating problems . . . electrically

Edwin L. Wiegand Company

7588 Thomas Boulevard, Pittsburgh 8, Pennsylvania A-4471

NEW **Ramset**

DUO-JOBMASTER



gives you

TWO TOOLS IN ONE!

RAMSET'S new tool has interchangeable barrels, to set either ¼" or ⅜" fasteners into steel or concrete—an added convenience to the time, temper and money-saving advantages of RAMSET FASTENING SYSTEM.

Will do all of your fastening jobs

Operator carries the second barrel in his pocket like a fountain pen, ready to set any variety of fasteners the job may require—light, medium or heavy duty anchoring into hard materials like concrete or steel.

Makes tough jobs easy

No more drilling or chipping; fasteners are set instantly, accurately and permanently with a press of the trigger.

Learn about this low-cost, time-saving, modern way to fasten. Find for yourself what it can mean to any construction job. A demonstration will convince you.

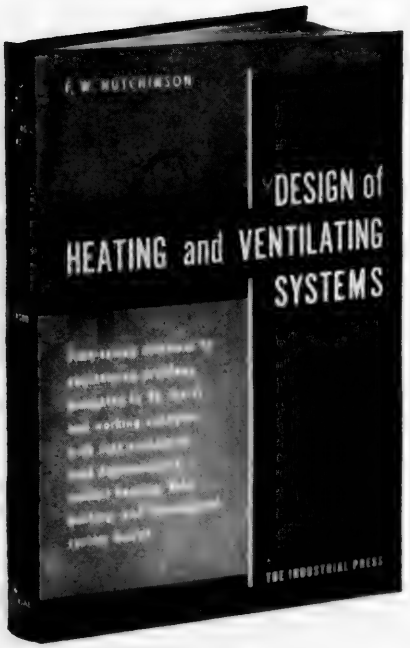
Ramset Fastening System

WINCHESTER-WESTERN DIVISION
OLIN MATHIESON CHEMICAL CORPORATION

FIRST IN POWDER-ACTUATED FASTENING

12135 BEREA ROAD • CLEVELAND 11, OHIO

DIRECT Solution of Heating and Ventilating Design Problems!



If you are concerned with problems in the design of heating and ventilating systems, here is a book that will save you hours of time and, in addition, insure accurate calculations for many complex calculations.

You can solve problems involving load determination, duct design, panel heating, solar heating and combustion analysis *directly* by means of the 96 full-page working graphs which are an outstanding feature of the book. In many cases the use of these graphs will entirely eliminate calculation, while in others the graphs serve to minimize the arithmetical work needed in solving the equations. The scales used in constructing the graphs have been selected so that *the accuracy to which each graph can be read will equal or exceed the limits of accuracy of the equation from which it was derived.*

Opposite each graph is a design example and the solution illustrating the use of the method.

Explanatory text in each chapter clearly explains the engineering background and the mathematical basis of each graphical solution. Basic handbook data are also included so that, with the simple insertion of field data, design situations can be analyzed. Another important feature of the book is the inclusion of complete data for systems designed to utilize partial solar heating through the use of large picture windows. This is the first text on heating to include engineering data on this increasingly important subject.

The author is Professor of Mechanical Engineering at the University of California. He is the author of "Industrial Heat Transfer" and co-author of a number of books on panel heating, refrigeration and air conditioning. His knowledge of the field is well grounded on practical experiences as well as theory, as he acts as consultant for many industrial firms.

Just fill in the convenient order form below, check the method of payment you prefer, and DESIGN OF HEATING AND VENTILATING SYSTEMS will be sent immediately.

Introduction
Load Determination:
- Transmission Losses
- Intermittent Heating
- Ventilating and Humidification
- Losses from Ducts, Pipes and Tubes

Fuels and Combustion
Air Distribution
Conventional Heating System Design
Panel Heating Design Procedure
Solar Heating Design Procedure

320 Pages
96 Charts and Illustrations

$7.00

In Canada or overseas, $7.80

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

Please send me a copy of DESIGN OF HEATING AND VENTILATING SYSTEMS at $7.00 ($7.80 in Canada or overseas) under the terms of payment I have checked at the right.

Name .....
Firm .....
Street .....
City ..... Zone ..... State .....
Home Address .....
(Please fill in if you want book sent to your home)

ACHV-1/56

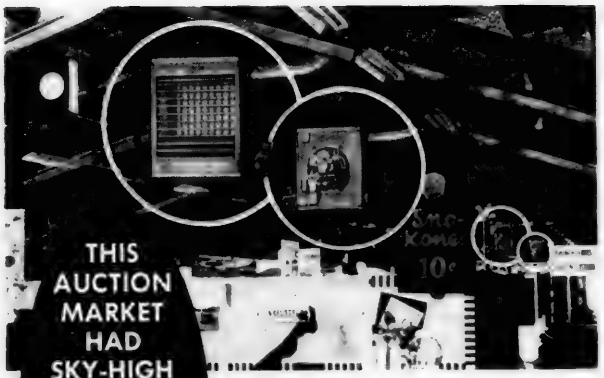
CHOOSE THE METHOD OF PAYMENT YOU PREFER

☐ Payment in full enclosed. Send book postpaid. (Book may be returned for full credit if you are not satisfied)

☐ Send book under Five-Day Free Inspection Plan. (Postage and handling charges of 15¢ per book are added)

☐ Bill me ☐ Bill Company

Note: Orders from overseas must be accompanied by payment in full in U. S. funds.



THIS AUCTION MARKET HAD SKY-HIGH FUEL BILLS . . . until Delta OIL UNIT HEATERS cut them down!

PROBLEM: Open only on weekends, this large, drafty farmer's auction market used abnormal quantities of fuel and still never warmed up sufficiently.

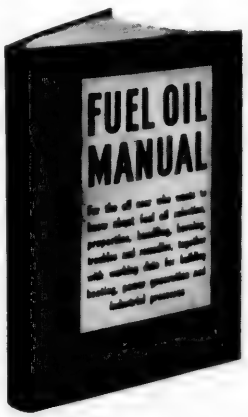
SOLUTION: 8 Delta oil-fired unit heaters were installed. They run on low cost #2 fuel oil and give immediate warm-up. Adjustable louvres direct heat where needed . . . without cold spots, overheating or heat wasted on walls or ceilings.

RESULTS: The market now is comfortably heated in an hour. Fuel bills have been cut almost 50%.

Send for complete new catalog AC

This is only one of hundreds of jobs that a Delta OIL Unit Heater can do better and more economically.

DELTA HEATING CORPORATION
TRENTON 8, NEW JERSEY



Here is a book that will give you a comprehensive picture of the characteristics and uses of every type and grade of fuel oil. The author explains the meaning of each oil property, and shows how this information is applied to the selection, handling and burning of fuel oil. Impurities and how they effect combustion are described fully, and a special chapter describes fuel oil additives and how they are used. Another chapter lists troubles which may be encountered in using fuel oils, and shows the correct remedy to apply in each case. Technical language is avoided wherever possible, and all terms are fully explained.

160 Pages **$3.50** 34 Tables

In Canada or overseas, $4.20

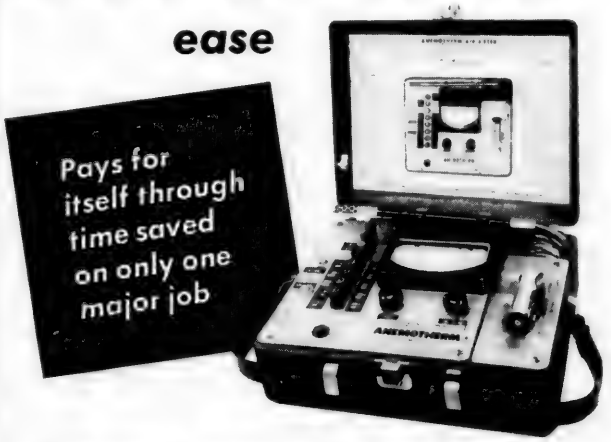
THE INDUSTRIAL PRESS
93 Worth Street New York 13, N. Y.

NEW Anemotherm Air Meter

gives you all vital readings with

PUSHBUTTON

ease



The Model 60 Anemotherm Air Meter, developed by the Anemostat Corporation of America, gives you—*in one convenient instrument*—a simple, rapid method of balancing and checking any air system. It puts at your fingertips, by means of *color-coded pushbuttons*—

Air Velocity

Measures air velocities from 10 to 8,000 fpm, in increments as small as 5 fpm—a wider velocity range than ever offered before. It is essentially non-directional.

Air Temperature

Provides rapid-response measurement of temperatures from 0 to 255F. Temperatures can be read with an accuracy of one-half of one degree.

Static Pressure

Measures static pressures directly in terms of inches of water, from 0" to 10" wg. positive or negative, with a sensitivity of better than .05" at lower range.

The new Anemotherm Air Meter saves time and money. Write for Bulletin 55 giving all essential data. AC 1336

ANEMOSTAT CORPORATION OF AMERICA
10 EAST 39th STREET, NEW YORK 16, N. Y.
MANUFACTURERS OF
ANEMOSTAT DRAFTLESS *Aspirating* AIR DIFFUSERS

❶ Proven, Westinghouse-manufactured, extended surface heating coils good for continuous operation up to 200 psig.

❷ Die-formed casings with rounded corners eliminate accidents and dirt catching pockets. Front and back panels easily removable.

❸ Multiple louvered outlets for efficient distribution of heated air.

❹ Self-aligning, grease-lubricated ball bearings mounted outside casing readily serviceable.

❺ Face and by-pass dampers permit continuous air circulation to maintain uniform temperatures.

NOTE: Louver-type mixing box accessory permits introduction of fresh air for make-up and ventilation, with or without filters.

Westinghouse...The Unit Heater for General Purpose and Heavy Duty Industrial Heating

★ These rugged units available in 24 sizes, 8 coil selections, 150 ratings—from 100,000 to 2,500,000 BTU/hr., capacities from 2000 to 25,000 CFM each.

★ GENERAL PURPOSE HEATER . . . For manufacturing areas, warehouses, garages, commercial buildings —with standard non-ferrous heating coils.

★ HEAVY-DUTY HEATER . . . For continuous-duty high-pressure systems, or industrial process work—with wrought iron heating coils.

★ FOR APPLICATION SERVICE . . . Call your nearest Sturtevant Sales Engineer or write Westinghouse Electric Corporation, Hyde Park, Boston 36, Mass. . . . ask for Booklet B-5188.

industry's Most Complete Line ***For:***
Heating & Ventilating
Industrial Processes
Cooling & Dehumidifying
Electronic Air Cleaning

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80451

ALPHABETICAL INDEX

A

Aerofin Corp. 13
Aerovent Fan Co., Inc. 145
Air Devices, Inc. 38
Airtemp Construction Corp. 26
Alco Valve Co. 29
Allen, W. D., Manufacturing Co. 142-143
American Air Filter Co., Inc. . . . 47-117
American Blower Corp. 36-37
American Gilsonite Co. 49
American Machine & Metals, Inc. 1
Anemostat Corp. of America 147
Atmos Corp. 141

B

Babcock & Wilcox Co., Boiler Div. 2
Barber-Colman Co. 25
Bethlehem Steel Co. 48
Binks Manufacturing Co. 149
Boiler Engineering & Supply Co., Inc. 138
Brunner Manufacturing Co. 39
Byers, A. M., Co. 9

C

Carnes Corp. 28
Chicago Pump Co. 30
Classified Advertisements 150
Cleaver-Brooks Co., Burner Div. . . 137
Committee on Steel Pipe Research 46
Connor Engineering Corp. 137
Copeland Refrigeration Corp. . . . 21
Coyne & Delany Co. 11
Curtis Refrigeration Machine Div., Curtis Manufacturing Co. Insert 51-52

D

Debothezat Fans Div., American Machine & Metals, Inc. 1
Delta Heating Corp. 147
Dollinger Corp. 32
Dunham, C. A., Co. 16-17-141

E

Elgo Shutter & Mfg. Co. 144

F

Fairbanks Co. 144
Farr Co. 50
Frick Company 129

G

General Electric Co. 22-23
Grinnell Co., Inc. . . . . Inside Front Cover
Gustin-Bacon Mfg. Co. 4

H

Halstead & Mitchell 113
Hartzell Propeller Fan Co. 125
Heat-Timer Corp. 144
Henry Valve Co. . . . . Inside Back Cover

I

Illinois Engineering Co. 42
Industrial Press 146-147
Industrial Sound Control, Inc. . . 55
Infra Insulation, Inc. 7
Inland Steel Co. 40-41

ALPHABETICAL INDEX

J

Johnson Service Co. 31
Josam Manufacturing Co. 139

K

King Zeero Co. 141
Kritzer Radiant Coils, Inc. . . . 27

M

Magnetrol, Inc. 129
Marley Co. 35
McDonnell & Miller, Inc. . . . . Back Cover
Minneapolis-Honeywell Regulator Co. 18-19
Modine Manufacturing Co. 20-150

N

Nash Engineering Co. 5
National Coal Association 121
National Tube Div., United States Steel Corp. 127
Nesbitt, John J., Inc. 140
Niagara Blower Co. 130

O

Olson, Arthur A. & Co. 128

P

Patterson-Kelley Co., Inc. 135
Peerless of America, Inc. 123
Penn Ventilator Co. 139
Powers Regulator Co. 43-115

R

Radiant-Ray Radiation, Inc. 136
Ramset Fastening System, Winchester-Western Div., Olin Mathieson Chemical Corp. . . . 145
Revere Copper & Brass, Inc. 111
Rigidbilt, Inc. 139

S

Sarcotherm Controls, Inc. 45
Spence Engineering Co., Inc. 54
Sturtevant Div., Westinghouse Electric Corp. 148

U

United States Steel Corp., National Tube Div. 127

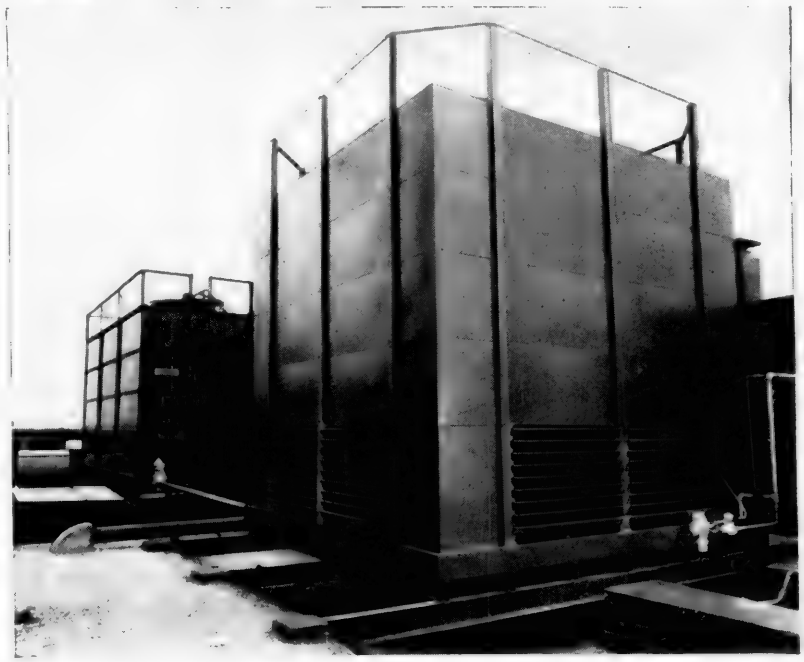
W

Wagner Electric Corp. 24
Want Advertisements 150
Webster, Warren & Co. . . . Insert 33-34
Westinghouse Electric Corp., Sturtevant Div. 148
Wiegand, Edwin L., Co. 145
Wing, L. J., Mfg. Co. 119

Y

Yarnall-Waring Co. 53
York Corp. 14-15
Youngstown Sheet & Tube Co. . . . 44

COOLING TOWER NEWS



Here's why Chicago's Hotel LaSalle chose a Binks tower—19 years later!

Last summer Chicago's Hotel LaSalle air conditioned its public rooms. To cool the large compressors the hotel purchased a 350-ton capacity Binks cooling tower...and for good reason:

Nineteen years ago—in 1937—the hotel erected a 200-ton Binks tower on the roof, 22 stories above the street, exposed to the Windy City's constantly changing weather. As can be seen in the above picture, that tower (left) is still in excellent condition. It gives the same high efficiency cooling that it did when it was new. Its maintenance has been economical in both time and dollars—despite its exposure to the elements for 19 years. With such time-tested proof of dependability, it is no wonder that the Hotel LaSalle chose Binks to supply its new tower.

Standardized models assure economy

Binks complete line of forced and natural draft cooling towers is built from standardized panels and parts. They are available in capacities from 3 to 1000 tons. These towers are engineered to provide the correct air-to-water ratios for proper cooling under your local conditions. They are ruggedly constructed of heavy gauge steel, protected from moisture and the elements by galvanizing and complete shop painting.

In Binks' wide range of Cooling Tower models there is one for nearly every size and type of installation... a tower that precisely fills your specifications without costly design or custom construction.

ENGINEERING HELP AVAILABLE

To help you select the right type and capacity tower a Binks Engineer will gladly study your needs and submit proposals without obligation. For full details, write to the address below:

609

Binks

EVERYTHING FOR WATER COOLING

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company

3120-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

GAS-FIRED UNIT HEATERS

by **Modine**

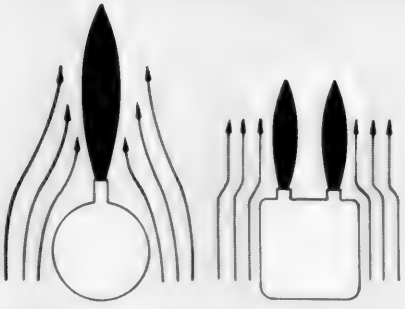
save you money right from the start

Lightweight cuts shipping, installation costs

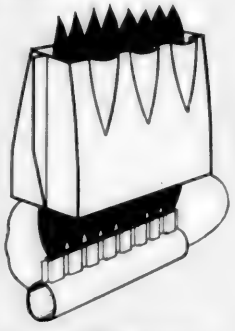
WEIGHT COMPARISON		
Brand	Capacity (Btu/hr. input)	Approx. Net Weight
Modine (aluminized steel)	105,000	105
Modine (stainless steel)	105,000	95
Brand "A"	100,000	170
Brand "B"	102,000	196
Brand "C"	90,000	175
Brand "D"	100,000	165
Brand "E"	100,000	210
Brand "F"	100,000	210
Brand "G"	105,000	170

Light weight, without sacrifice of strength or efficiency, makes Modine Unit Heaters easier to handle, faster to install. Also cuts need for expensive support structures.

THESE DESIGN ADVANTAGES REDUCE OPERATING COSTS



More usable heat per fuel dollar
Single-row burner ports help insure adequate secondary air supply. As a result, you get maximum combustion efficiency, more delivered heat per fuel dollar.



Faster, more uniform heating
Continuous flame from front to rear of individually-fired exchangers, increases radiant heat absorption, uniformly distributes heat through tube.

LONGER LIFE . . .
AND . . .
LOW-COST SERVICE

Stainless steel slashes corrosion loss
Modine burners, to all practical purposes, are unaffected by acid corrosion, rusting and scaling . . . give you many years of trouble-free, top efficiency.

GU-1270

NEW 12-PAGE BULLETIN 655
gives you more complete information, selection and application data. Call the Modine representative listed in your classified phone book. Or write — Modine Mfg. Co., 1511 DeKoven Ave., Racine, Wisconsin.

Modine
UNIT HEATERS

CLASSIFIED ADVERTISING

"Manufacturer's Representative, Pittsburg area —Heating experience and knowledge of I.B.R. Heating Calculations to promote for the first time in Pittsburg area, gas and oil fired boilers and baseboard radiation. This manufacturer is a factor in the wet heat industry. Sales are to be promoted for the heating contractor, through builders and orders placed with us through wholesale plumbing and heating supply houses." Write Box 870, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

"Manufacturer's Agent, ME, Contacting Commercial, Industrial Insulation Contractors and sheet metal contractors in states of Texas, Oklahoma, Louisiana, Arkansas, desires additional quality line. Box 871, Air Conditioning, Heating & Ventilating", 93 Worth St., New York 13, N. Y.

PLUMBING-HEATING, 1954 sales $55,229, attractive new building, eastern city, completely equipped shop, 3 trucks, full line plumbing-heating necessities and garden machinery; with property, terms. Apple Co., Brokers, Cleveland 15, Ohio.

Manufacturer's Representative

Seeking new lines? Register your name, territory, line with us. We often get requests from manufacturers seeking representatives. Write Research Director, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

..because they went to their doctors in time

Many thousands of Americans are being cured of cancer every year. More and more people are going to their doctors *in time.*

But the tragic fact, our doctors tell us, is that every third cancer death is a needless death... *twice* as many could be saved.

For the facts of *life* about cancer, call the American Cancer Society office nearest you or write to "Cancer" in care of your local Post Office.

American Cancer Society ®

STEAM LOSSES FROM STEEL PIPING — 14 TO 24 INCH PIPE

A	B	C	D	E	F	Nominal Pipe Diameter, Inches				
Temp. Diff., Deg.	Sat. Steam Temp. (Col. A +70 Deg.)	Abs. Steam Press. for Col. B Temp.	Latent Heat, Btu per Lb.	Heat Loss, Btu per Sq. Ft. per Hr.	Heat Loss, Lb. per Sq. Ft. per Hr.	14	16	18	20	24
						Outside Surface Area, Sq. Ft., per 100 Lineal Feet				
						366.52	418.88	471.24	523.60	628.32
						Pounds of Steam Lost per Hour per 100 Lineal Feet				
265	335	110	882.7	809.86	0.9175	336.28	384.32	432.36	480.40	576.48
270	340	118	878.5	833.88	0.9492	347.90	397.60	447.30	497.00	596.40
275	345	126	874.4	857.90	0.9811	359.59	410.96	462.33	513.70	616.44
280	350	135	870.2	881.92	1.0135	371.47	424.53	477.60	530.67	636.80
285	355	144	865.8	905.94	1.0464	383.53	438.32	493.11	547.90	657.47
290	360	153	861.7	929.96	1.0792	395.55	452.06	508.56	565.07	678.08
295	365	163	857.4	953.98	1.1126	407.79	466.05	524.30	582.56	699.07
300	370	173	853.0	978.00	1.1465	420.22	480.25	540.28	600.31	720.37
305	375	184	848.6	1007.14	1.1868	434.99	497.13	559.27	621.41	745.69
310	380	196	844.1	1036.28	1.2277	449.98	514.26	578.54	642.82	771.39
315	385	208	839.5	1065.42	1.2691	465.15	531.60	598.05	664.50	797.40
320	390	220	834.9	1094.56	1.3110	480.51	549.15	617.80	686.44	823.73
325	395	233	830.3	1123.70	1.3534	496.05	566.91	637.78	708.64	850.37
330	400	248	825.5	1152.84	1.3965	511.85	584.97	658.09	731.21	877.45
335	405	262	820.6	1181.98	1.4404	527.94	603.35	678.77	754.19	905.03
340	410	277	815.8	1211.12	1.4846	544.14	621.87	699.60	777.34	932.80
345	415	292	810.8	1240.26	1.5297	560.67	640.76	720.86	800.95	961.14
350	420	309	805.8	1269.40	1.5753	577.38	659.86	742.34	824.83	989.79
355	425	326	800.7	1303.86	1.6284	596.84	682.10	767.37	852.63	1023.2
360	430	344	795.5	1338.32	1.6824	616.63	704.72	792.81	880.90	1057.1
365	435	362	790.2	1372.78	1.7373	636.76	727.72	818.69	909.65	1091.6
370	440	382	784.9	1407.24	1.7929	657.13	751.01	844.89	938.76	1126.5
375	445	402	779.4	1441.70	1.8498	677.99	774.84	871.70	968.56	1162.3
380	450	423	773.8	1476.16	1.9077	699.21	799.10	898.98	998.87	1198.6
385	455	444	768.1	1510.62	1.9667	720.83	823.81	926.79	1029.8	1235.7
390	460	467	762.3	1545.08	2.0269	742.90	849.03	955.16	1061.3	1273.5
395	465	490	756.4	1579.54	2.0882	765.37	874.71	984.04	1093.4	1312.1
400	470	515	750.3	1614.00	2.1511	788.42	901.05	1013.7	1126.3	1351.6
405	475	540	744.1	1657.66	2.2277	816.50	933.14	1049.8	1166.4	1399.7
410	480	566	737.8	1701.32	2.3059	845.16	965.90	1086.6	1207.4	1448.8
415	485	593	731.3	1744.98	2.3861	874.55	999.49	1124.4	1249.4	1499.2
420	490	622	724.7	1788.64	2.4681	904.61	1033.8	1163.1	1292.3	1550.8
425	495	651	718.0	1832.30	2.5519	935.32	1068.9	1202.6	1336.2	1603.4
430	500	681	711.1	1875.96	2.6381	966.92	1105.0	1243.2	1381.3	1657.6
435	505	712	704.1	1919.62	2.7263	999.24	1142.0	1284.7	1427.5	1713.0
440	510	745	696.9	1963.28	2.8172	1032.6	1180.1	1327.6	1475.1	1770.1
445	515	778	689.6	2006.94	2.9103	1066.7	1219.1	1371.4	1523.8	1828.6
450	520	813	682.1	2050.60	3.0063	1101.9	1259.3	1416.7	1574.1	1888.9
455	525	848	674.6	2104.54	3.1197	1143.4	1306.8	1470.1	1633.5	1960.2
460	530	885	666.8	2158.48	3.2371	1186.5	1356.0	1525.5	1694.9	2033.9
465	535	923	659.0	2212.42	3.3572	1230.5	1406.3	1582.0	1757.8	2109.4
470	540	963	651.0	2266.36	3.4814	1276.0	1458.3	1640.6	1822.9	2187.4
475	545	1003	642.8	2320.30	3.6097	1323.0	1512.0	1701.0	1890.0	2268.0
480	550	1045	634.5	2374.24	3.7419	1371.5	1567.4	1763.3	1959.3	2351.1
485	555	1089	626.1	2428.18	3.8783	1421.5	1624.5	1827.6	2030.7	2436.8
490	560	1133	617.5	2482.12	4.0196	1473.3	1683.7	1894.2	2104.7	2525.6
495	565	1180	608.7	2536.06	4.1664	1527.1	1745.2	1963.4	2181.5	2617.8
500	570	1228	599.7	2590.00	4.3188	1582.9	1809.1	2035.2	2261.3	2713.6

DIMENSIONAL AND CAPACITY DATA — COPPER DRAINAGE TUBE

Diameter, Inches			Wall Thickness, In.	Cross-Sectional Area, Sq. In.			Weight per Foot, Lb.		
Nominal	Actual Inside	Actual Outside		Outside	Inside	Metal	Of Tube Alone	Of Water in Tube	Of Tube and Water
1¼	1.295	1.375	0.040	1.484	1.317	0.167	0.650	0.572	1.222
1½	1.541	1.625	0.042	2.072	1.865	0.207	0.809	0.809	1.618
2	2.041	2.125	0.042	3.546	3.272	0.274	1.07	1.42	2.49
3	3.035	3.125	0.045	7.669	7.234	0.435	1.69	3.14	4.83
4	4.009	4.125	0.058	13.361	12.623	0.738	2.87	5.48	8.35
5	4.981	5.125	0.072	20.626	19.486	1.140	4.43	8.46	12.89
6	5.959	6.125	0.083	29.453	27.890	1.563	6.10	12.10	18.20

Nominal Dia., In.	Circumference, Inches		Sq. Ft. of Surface per Lineal Foot		Contents of Tube per Lineal Foot		Lineal Feet to Contain		
	Outside	Inside	Outside	Inside	Cu. Ft.	Gal.	1 Cu. Ft.	1 Gal.	1 Lb. of Water
1¼	4.318	4.068	0.360	0.339	.00914	0.0684	109.4	14.6	1.75
1½	5.103	4.841	0.425	0.403	.01294	0.0968	77.3	10.3	1.24
2	6.673	6.412	0.556	0.534	.02271	0.1699	44.0	5.89	0.707
3	9.813	9.535	0.818	0.795	.05020	0.3755	19.92	2.66	0.319
4	12.953	12.595	1.080	1.050	.08760	0.6552	11.42	1.53	0.184
5	16.093	15.648	1.341	1.304	.13523	1.1520	7.39	0.868	0.104
6	19.233	18.721	1.603	1.560	.19356	1.4478	5.17	0.690	0.083

Copper drainage tube has been developed specifically for sanitary drainage service. It can be installed by a simple soldering operation in which the solder is drawn into the joint by capillary action. A complete selection of drainage fittings, featuring long radius elbows, are available for soldered connection to copper tube. These fittings also include fittings with one or more outlets threaded for use with brass or copper pipe or with slip joints. Bends, both adjustable and fixed, with suitable flanges for closet connections, are also available.

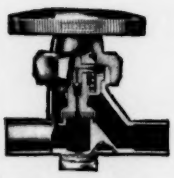
Soldered drainage fittings are installed by the same technic that most plumbers have already developed in connection with water lines.

In connection with residences, the actual selection of sizes in most instances is controlled by code requirements, but a 3-inch copper tube stack with not over three branch intervals will accommodate 30 fixture units (not over two water closets). Where not fixed by code, a sanitary engineer or other qualified designer would probably specify a 3-inch stack, which will easily fit between 2 x 4 studs. Copper drainage tube may be used equally well in multi-story buildings. Vent headers and waste lines should be long enough to take up expansion in the stacks.

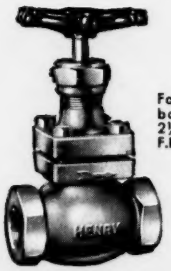
Type K copper water tube is recommended for use with soldered or compression fittings, for general plumbing involving relatively severe service conditions, and for heating, gas, steam, oil lines and underground service.

Type L copper water tube can also be used with soldered or compression fittings, and is intended for general plumbing work involving relatively less severe conditions than with Type K, the wall thickness being thinner than Type K.

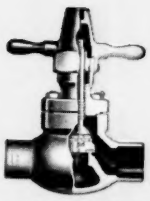
Type M, with thinner walls than either Type K or Type L, is recommended for use with soldered fittings only, for interior application, for heating and for waste, vent, soil, and other non-pressure applications.



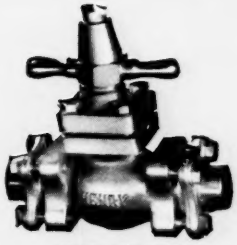
PACKLESS VALVE
With balanced-action. Sizes ¼" through ⅝" Fl., ¼" through 1⅝" O.D.S.



AMMONIA VALVE
Forged steel or semi-steel bodies. Sizes ¼" through 2½" F.P.T., 1¼" through 6" F.P.T. slip-on welding or welding neck flanges.



WING CAP VALVE
Non-ferrous. Sizes ⅞" through 4⅛" O.D.S.



WING CAP VALVE
Semi-steel screwed or flanged types. Sizes 1¼" through 6".

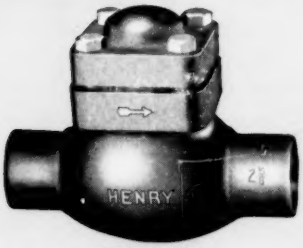
HENRY VALVE CO
CONTROLLING FLOW
SINCE 1914

you pay—
no premium for..
the extra advantages found in
Henry products
or for the extra satisfaction that follows their use

STRAINER
Angle type with patented distortion-type flange. Sizes ⅜" through 4⅛" O.D.S., 2½" through 4" butt weld.

Y-STRAINER
Brass plated. Welded steel construction. Forged brass connections. Sizes ⅝" through 4⅛" O.D.S., 2½" through 4" butt weld.

BALANCED-ACTION PACKLESS LIQUID LEVEL GAUGES
Valves are backseating—diaphragms may be inspected or replaced without loss of liquid. Conforms with all safety code requirements. Also packed types, capped or with hand wheels.



CHECK VALVE
Piston Type For Freon. Sizes ⅜" through 4⅛" O.D.S.

DRIER
Cartridge type 12 to 500 cu. in. capacity. Sizes ⅜" to 2⅛" O.D.S

DRIER
Large diameter and capacity. All brass construction. Minimum pressure drop.

UV NB

STRAIGHT-THROUGH RELIEF VALVE
Large capacity—All brass construction. Sizes ½" through 1" P.T. Meet A.S.M.E. standards, National Board Certified. Other sizes and types available.

DIAPHRAGM RELIEF VALVE
Operates independently of outlet pressure permitting use of rupture disc assembly on outlet side without increasing initial leak pressure. Forged brass bodies. Sizes, ⅜" & ½" I.P.S., ¾" & ⅞" O.D.S.

... Write for these catalogs

No. 101 Packless and packed valves, strainers, driers, check valves, relief valves, three-way valves, liquid gauge sets, flange unions and accessories for air conditioning, refrigeration and industrial uses.

No. 201 Ammonia valves and accessories.

No. 71 Drop forged and cold rolled steel fittings.

Stocked and Sold by Leading Jobbers

VALVES • DRIERS • STRAINERS • CONTROL DEVICES and ACCESSORIES FOR REFRIGERATION and AIR CONDITIONING and INDUSTRIAL APPLICATIONS

HENRY VALVE COMPANY

MELROSE PARK, ILLINOIS Chicago Suburb • Cable: HEVALCO MELROSE PARK, ILLINOIS

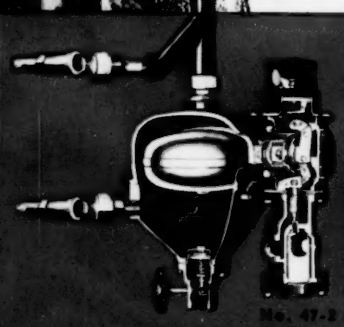
Don't let the gauge glass fool you...

That's a steam boiler all right in the picture above. The gauge glass gives it away.

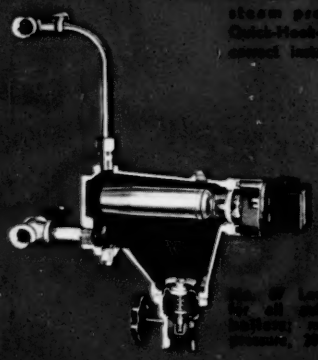
But to call attention to the perils of low water, Sam could be looking at a hot water boiler just as well.

Both steam boilers and hot water boilers are in the same boat when it comes to low water and the troubles and expense it can cause. True, the need was recognized with steam boilers first. But today many insurance companies, local codes and federal specifications insist on the same kind of protection for hot water heating boilers.

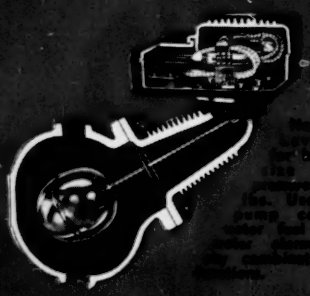
The best answer in either case is a McDonnell Feeder Cut-off Combination. To learn all the facts about low water in hot water boilers write for copy of new folder on "Basic Safety Controls for Hot Water Space Heating Boilers".



No. 47-2 Feeder-Cut-off Combination for boilers [illegible] sq. ft. maximum steam pressure, 25 lbs. Quick-Hook-Up for speedy, correct installation.



No. 47 Low Water Cut-off for all automatically fired boilers; maximum steam pressure, 30 lbs.



No. 10 Water Level Control for boilers of any size with steam pressures up to 15 lbs. Wash-in Feature cuts control, low-water fuel cut-off, for either steam, water or any combination of heat systems.

McDONNELL & MILLER, *Inc.*

3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

Your Jobber

McDONNELL

Boiler Water Level Controls